

## PATENT ABSTRACTS OF JAPAN

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(71)Applicant : KONICA CORP

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(72)Inventor : HAI GENKO  
FUJIMOTO SHINGO

## (54) ELECTROPHOTOGRAPHIC PHOTORECEPTOR

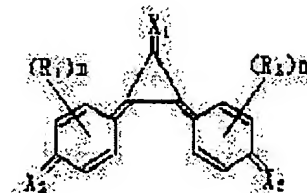
## (57)Abstract:

PURPOSE: To attain high sensitivity, low residual potential and satisfactory image characteristics by incorporating a specified compd. into a photosensitive layer on an electric conductive substrate.

CONSTITUTION: When a photosensitive layer is formed on an electric conductive substrate to obtain an electrophotographic photoreceptor, a compd. represented by formula I is incorporated into the photosensitive layer. In the formula I, each of X1-X3 is an org. residue which may have a substituent and X1-X3 may be different from one another. The compd. represented by the formula I is especially preferably a compd. represented by formula II, wherein each of X1-X3 is O, =N-CN, etc., each of R1 and R2 is alkyl, vinyl, ester, acyl, amido, H, cyano or nitro, each of the alkyl, vinyl, ester, acyl and amido may have a substituent. and each of (m) and (n) is an integer of 0-3. This compd. has electron transferring ability and the objective electrophotographic photoreceptor using the compd. as an electron transferring material has high sensitivity and stabilized characteristics of the photoreceptor at the time of repeated use.



I



II

## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

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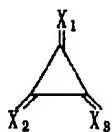
## CLAIMS

[Claim(s)]

[Claim 1] The electrophotography photo conductor which contains the compound expressed with the following general formula [A] in the aforementioned photosensitive layer in the electrophotography photo conductor which prepared the photosensitive layer on the conductive base material.

[Formula 1]

一般式 [A]

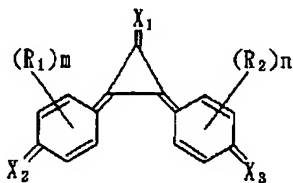


X<sub>1</sub>, X<sub>2</sub>, or X<sub>3</sub> is the organic residue which may have a substituent, and X<sub>1</sub> and X<sub>2</sub> may differ from X<sub>3</sub> mutually.

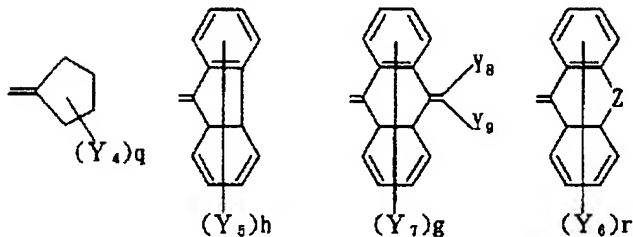
[Claim 2] The electrophotography photo conductor according to claim 1 characterized by the compound which the aforementioned general formula [A] expresses being a compound expressed with the following general formula [a1], [a2], and [a3].

[Formula 2]

一般式 [a<sub>1</sub>]



式中、X<sub>1</sub>, X<sub>2</sub>又はX<sub>3</sub>は酸素原子、=N-CN,  $\text{C} \begin{smallmatrix} \text{Y}_1 \\ \text{Y}_2 \end{smallmatrix}$ ,  $\text{C} \begin{smallmatrix} \text{Y}_1 \\ \text{Y}_2 \end{smallmatrix} \text{C} \begin{smallmatrix} \text{Y}_3 \\ \text{Y}_4 \end{smallmatrix}$ ,  $\text{C} \begin{smallmatrix} \text{Y}_1 \\ \text{Y}_2 \end{smallmatrix} \text{C} \begin{smallmatrix} \text{Y}_3 \\ \text{Y}_4 \end{smallmatrix} \text{C} \begin{smallmatrix} \text{Y}_5 \\ \text{Y}_6 \end{smallmatrix}$



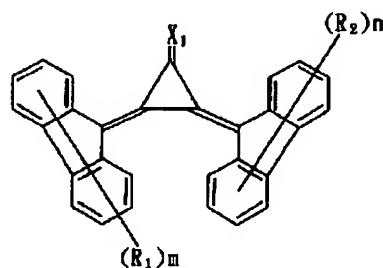
Qは酸素原子、 $\text{C} \begin{smallmatrix} \text{Y}_{10} \\ \text{Y}_{11} \end{smallmatrix}$ , =N-CN

R<sub>1</sub> and R<sub>2</sub> express the alkyl group which may have a substituent, the vinyl group which may have a substituent, the ester machine which may have a substituent, the acyl group which may have a substituent, the amide group which may have a substituent and a hydrogen atom, a cyano group, and a nitro group. m and n express the integer of 0-3. k, g, h, p, q, and r express the integer of 0-3. Y<sub>1</sub>-Y<sub>9</sub> express a hydrogen atom, a cyano group, a nitro group, a halogen machine or the ester machine that may be replaced, the acyl group which may be replaced, the amide group which may be replaced, the vinyl group which may be replaced, and the phenyl group which may be replaced. Z expresses an oxygen atom, a sulfur atom, and =C=O. Furthermore, Y<sub>10</sub> and Y<sub>11</sub> express a hydrogen atom, a halogen atom, a cyano group, a nitro group or the ester machine that may be replaced, the acyl group which may be replaced, the amide group which may be

replaced, the vinyl group which may be replaced, and the phenyl group which may be replaced.

[Formula 3]

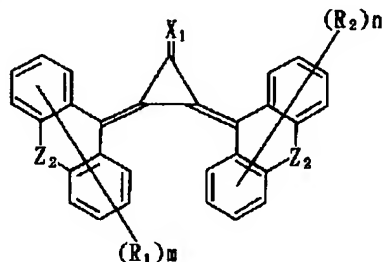
一般式 [a<sub>2</sub>]



X1, R1, and R2 are the same as that of a general formula [a1] among a formula.

[Formula 4]

一般式 [a<sub>3</sub>]

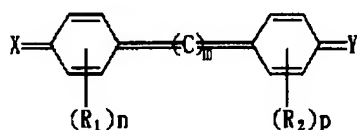


X1, R1, and R2 are the same as that of a general formula [a1] among a formula. However, Z2 is an oxygen atom, a sulfur atom, =C=O, and =C=C (Y12) (Y13). Y12 and Y13 express a hydrogen atom, a cyano group, a nitro group, a halogen machine or the ester machine that may be replaced, the acyl group which may be replaced, the amide group which may be replaced, the vinyl group which may be replaced, and the phenyl group which may be replaced.

[Claim 3] The electrophotography photo conductor which contains the compound expressed with the following general formula [B] to the aforementioned photosensitive layer in the electrophotography photo conductor which prepared the photosensitive layer on the conductive base material.

[Formula 5]

一般式 [B]

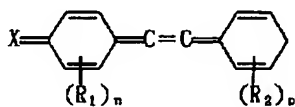


Setting to a general formula [B], X and Y are =O. It is =C (Z), (W), and =N-CN, and Z and W are a hydrogen atom, a halogen atom or -CN, R3 substitution phenyl group (R3 is each basis or hydrogen atom of an alkyl, an acyl, ester, a methoxy, -CF3, -CN, and -NO2), and an ester machine further. R1 and R2 are each basis of an alkyl, an alkoxy \*\* acyl, ester, a phenyl, an amide, and a sulfonamide. Moreover, m expresses the integer of 1-4. When it is two or more any of n>=0, p>=0, however n and p they are, R1 may differ from R2 mutually.

[Claim 4] The electrophotography photo conductor according to claim 3 characterized by the compound which the aforementioned general formula [B] expresses being a compound expressed with the following general formula [b].

[Formula 6]

一般式 [b]



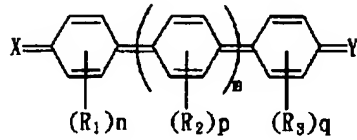
In a general formula [b], X is =O, =C (Z), (W), and =N-CN, and Z and W are a hydrogen atom, a halogen atom or -CN, R3 substitution phenyl group (R3 is each basis or hydrogen atom of an alkyl, an acyl, ester, a methoxy, -CF3, -CN, and -NO2), and an ester machine further. R1 and R2 are each basis of an alkyl, an alkoxy \*\* acyl, ester, a phenyl, an amide, and a sulfonamide. When either n>=0, p>=0 however n and p are two or more, R1 may differ from R2 mutually.

[Claim 5] The electrophotography photo conductor which contains the compound expressed with the following general formula [C] to the aforementioned photosensitive layer in the electrophotography photo conductor which prepared the

photosensitive layer on the conductive base material.

[Formula 7]

一般式 [C]



In a general formula [C], X and Y are =O, =C (Z), (W), and =N-CN, and Z and W are a hydrogen atom, a halogen atom or -CN, and R4 substitution phenyl group (R4 is each basis or hydrogen atom of alkyl, acyl, ester, methoxy, -CF<sub>3</sub>, -CN, and -NO<sub>2</sub>) ester machine further. R1, R2, or R3 is each basis of an alkyl, an alkoxy \*\* acyl, ester, a phenyl, an amide, and a sulfonamide. Moreover, m expresses the integer of 1-2. It is p>=1 at the time of m= 1. It is p>=0 at the time of m= 2. When either q>=0, n>=0 however q and n are two or more, R1 and R2 may differ from R3 mutually.

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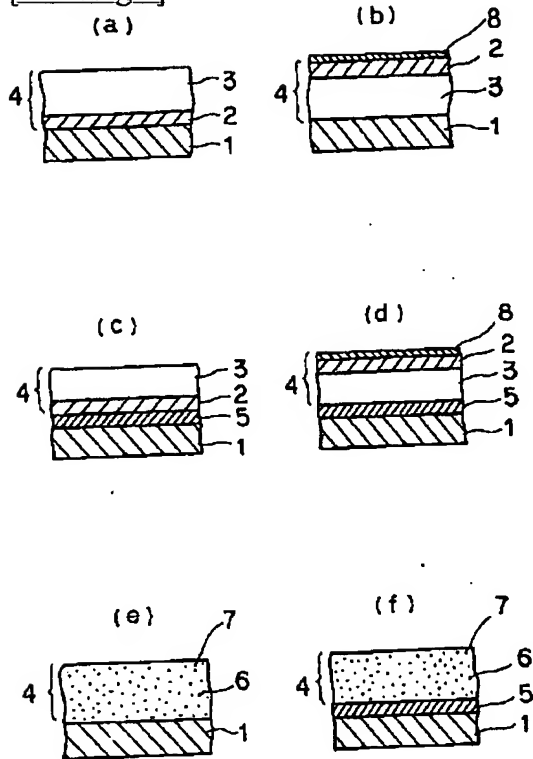
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## DRAWINGS

[Drawing 1]



[Translation done.]

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the electrophotography photo conductor for making an electrostatic latent image form. Furthermore, when it explains in full detail, it is related with the electrophotography photo conductor which has a layer containing the compound which has electronic transportation ability.

[0002]

[Description of the Prior Art] Conventionally, since the electrophotography photo conductor using the organic photo conductor has advantages, such as pollution-free, high productivity, and a low cost, it is studied variously, and practical use is actually presented with it as a photo conductor of the copying machine for inside low speeds. Although there is a laminating type and monolayer type thing in these electrophotography photo conductor, the photo conductor using the organic photo conductor has taken the laminated structure which consists of a charge generating layer which generally generates a charge by optical irradiation, and a charge transporting bed which conveys the produced charge. In this case, a low molecular weight compound like polymeric materials like Poly N-vinylcarbazole as charge transportation matter used for a charge transporting bed, a pyrazoline and a hydrazone, and a triphenylamine derivative is used.

[0003] However, since each of these charge transportation matter has electron hole transportation ability, it is almost the case that the development method which electrifies the front face of a photo conductor in negative is taken. For this reason, the toner conventionally used with the high-speed machine cannot be used, but, as for the present condition, there are few high-definition things. Furthermore, when electrifying a photo conductor front face in negative in this way, there is a problem of ozone occurring by the reaction with the oxygen in air, and degrading about [injuring environment] or a photo conductor front face at the time of electrification.

[0004] Moreover, although the laminating photo conductor for right electrification which, on the other hand, made reverse lamination of the photosensitive layer of a laminating photo conductor, prepared the electronic transporting bed in the bottom and prepared the electronic generating layer in the bottom is developed, electrification potential is low, and since print durability is inferior, it has the composition of preparing a protective layer further on an electronic generating layer.

[0005]

[Problem(s) to be Solved by the Invention] What is necessary is to use for a charge transporting bed the charge transportation matter which has electronic transportation ability, and just to constitute the photo conductor the photo conductor front face was made to just be charged further, in order to solve the above problems. as such an electronic transportability material -- 2, 4, and 7-trinitro-9-full -- me -- although non was known, solubility was bad and was not able to take out practical sensitivity combining the existing charge generating matter furthermore, 2, 4, and 7-trinitro-9-full -- me -- the electronic transportability matter which introduced the solubilization machine into electron acceptor structure is proposed as a result of improvement research of non in recent years For example, JP,1-206349,A, 2-135362, 2-214866, 3-290666 and "Japan Hardcopy'92" collected works, 173, and (1992) can be mentioned. However, when any compound makes a photo conductor combining the existing charge generating matter, sensitivity is still insufficient practical and the present condition is being unable to acquire a good picture.

[0006] this invention has the purpose of this invention in offering the electrophotography photo conductor using the charge transportation matter which has electronic transportation ability in view of the above troubles.

[0007] Other purposes of this invention are to offer the laminating type electrophotography photo conductor for right electrification which has the outstanding electrophotography performance, i.e., high sensitivity, a low rest potential, and a good picture property.

[0008]

[Means for Solving the Problem] This invention persons found out that the purpose of this invention was attained with

any following electrophotography photo conductor as a result of research. Namely, the electrophotography photo conductor which contains the compound expressed with the following general formula [A] in the aforementioned photosensitive layer in the electrophotography photo conductor which prepared the photosensitive layer on (1) conductivity base material.

[0009]

[Formula 8]

一般式〔A〕



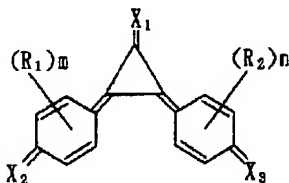
[0010] X1, X2, or X3 is the organic residue which may have a substituent, and X1 and X2 may differ from X3 mutually.

[0011] (2) It is the electrophotography photo conductor with which the compound which the aforementioned general formula [A] expresses desirably is especially characterized by being the compound expressed with the following general formula [a1], [a2], and [a3].

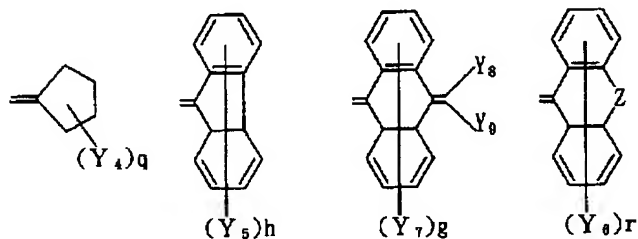
[0012]

[Formula 9]

一般式  $(a_1)$



式中、 $X_1$ 、 $X_2$ 又は $X_3$ は酸素原子、 $=N-CN$ 、 $=C \begin{smallmatrix} Y_1 \\ Y_2 \end{smallmatrix}$ 、 $\begin{array}{c} \text{---} \text{C}_6\text{H}_4 \text{---} \\ | \\ (Y_3)_k \end{array} Q$



Qは酸素原子、 $=C \begin{matrix} Y_{10} \\ Y_{11} \end{matrix}$  ,  $=N-CN$

[0013] R1 and R2 express the alkyl group which may have a substituent, the vinyl group which may have a substituent, the ester machine which may have a substituent, the acyl group which may have a substituent, the amide group which may have a substituent and a hydrogen atom, a cyano group, and a nitro group.

[0014] m and n express the integer of 0-3.

[0015] k, g, h, p, q, and r express the integer of 0-3.

[0016] Y1-Y9 express a hydrogen atom, a cyano group, a nitro group, a halogen machine or the ester machine that may be replaced, the acyl group which may be replaced, the amide group which may be replaced, the vinyl group which may be replaced, and the phenyl group which may be replaced.

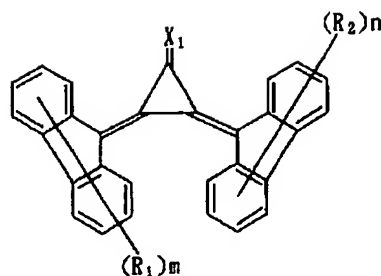
[0017] Z expresses an oxygen atom, a sulfur atom, and =C=O.

[0018] Furthermore, Y10 and Y11 express a hydrogen atom, a halogen atom, a cyano group, a nitro group or the ester machine that may be replaced, the acyl group which may be replaced, the amide group which may be replaced, the vinyl group which may be replaced, and the phenyl group which may be replaced.

[0019]

[Formula 10]

一般式 [a<sub>2</sub>]

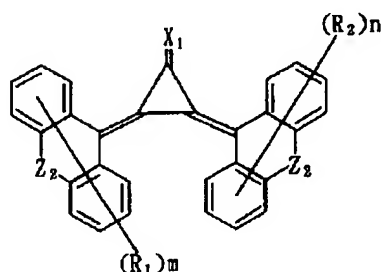


[0020] X<sub>1</sub>, R<sub>1</sub>, and R<sub>2</sub> are the same as that of a general formula [a<sub>1</sub>] among a formula.

[0021]

[Formula 11]

一般式 [a<sub>3</sub>]



[0022] X<sub>1</sub>, R<sub>1</sub>, and R<sub>2</sub> are the same as that of a general formula [a<sub>1</sub>] among a formula.

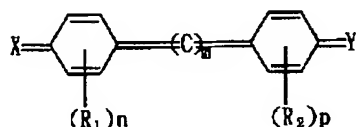
[0023] However, Z<sub>2</sub> is an oxygen atom, a sulfur atom, =C=O, and =C=C (Y<sub>12</sub>) (Y<sub>13</sub>). Y<sub>12</sub> and Y<sub>13</sub> express a hydrogen atom, a cyano group, a nitro group, a halogen machine or the ester machine that may be replaced, the acyl group which may be replaced, the amide group which may be replaced, the vinyl group which may be replaced, and the phenyl group which may be replaced.

[0024] (3) The electrophotography photo conductor which contains the compound expressed with the following general formula [B] to the aforementioned photosensitive layer in the electrophotography photo conductor which prepared the photosensitive layer on the conductive base material.

[0025]

[Formula 12]

一般式 [B]



[0026] In a general formula [B], X and Y are =O, =C (Z), (W), and =N-CN, and Z and W are a hydrogen atom, a halogen atom or -CN, R<sub>3</sub> substitution phenyl group (R<sub>3</sub> is each basis or hydrogen atom of an alkyl, an acyl, ester, a methoxy, -CF<sub>3</sub>, -CN, and -NO<sub>2</sub>), and an ester machine further.

[0027] R<sub>1</sub> and R<sub>2</sub> are each basis of an alkyl, an alkoxy \*\* acyl, ester, a phenyl, an amide, and a sulfonamide. Moreover, m expresses the integer of 1-4.

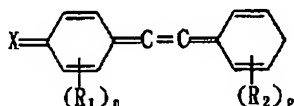
[0028] When either n>=0, p>=0 however n and p are two or more, R<sub>1</sub> may differ from R<sub>2</sub> mutually.

[0029] (4) The electrophotography photo conductor of (3) characterized by the compound which the aforementioned general formula [B] expresses being a compound expressed with the following general formula [b].

[0030]

[Formula 13]

一般式 [b]



[0031] In a general formula [b], X is =O, =C (Z), (W), and =N-CN, and Z and W are a hydrogen atom, a halogen atom or -CN, R<sub>3</sub> substitution phenyl group (R<sub>3</sub> is each basis or hydrogen atom of an alkyl, an acyl, ester, a methoxy, -CF<sub>3</sub>, -CN, and -NO<sub>2</sub>), and an ester machine further.



[0032] R1 and R2 are each basis of an alkyl, an alkoxy \*\* acyl, ester, a phenyl, acid, and a sulfonamide.

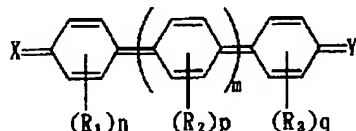
[0033] When either  $n \geq 0$ ,  $p \geq 0$  however n and p are two or more, R1 may differ from R2 mutually.

[0034] (5) The electrophotography photo conductor which contains the compound expressed with the following general formula [C] to the aforementioned photosensitive layer in the electrophotography photo conductor which prepared the photosensitive layer on the conductive base material.

[0035]

[Formula 14]

一般式 [C]



[0036] Setting to a general formula [C], X and Y are =O. It is =C (Z), (W), and =N-CN, and Z and W are a hydrogen atom, a halogen atom or -CN, and R4 substitution phenyl group (R4 is each basis or hydrogen atom of alkyl, acyl, ester, methoxy, -CF3, -CN, and -NO2) ester machine further.

[0037] R1, R2, or R3 is each basis of an alkyl, an alkoxy \*\* acyl, ester, a phenyl, an amide, and a sulfonamide.

Moreover, m expresses the integer of 1-2. It is  $p \geq 1$  at the time of  $m = 1$ . It is  $p \geq 0$  at the time of  $m = 2$ .

[0038]  $q \geq 0$ ,  $n \geq 0$  However, when q or n is two or more, R1 and R2 may differ from R3 mutually.

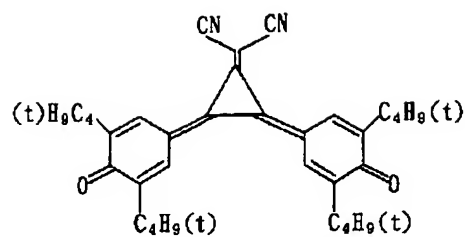
[0039] The high performance as electronic transportation matter of this invention is considered to originate in prolonged compatibility with a binder having come to be kept stable compared with the conventional electronic transportation matter.

[0040] Next, the example of a compound expressed with the aforementioned general formula and its synthetic example are shown.

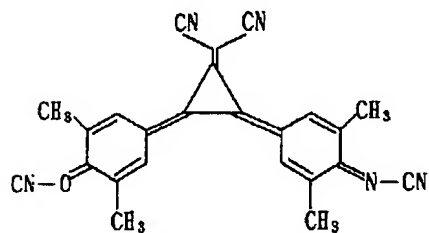
[0041] (A) The compound expressed with a general formula [A] : instantiation compound : [0042]

[Formula 15]

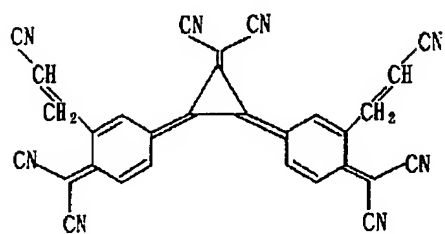
A - 1



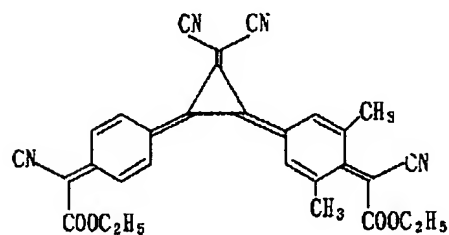
A - 2



A - 3



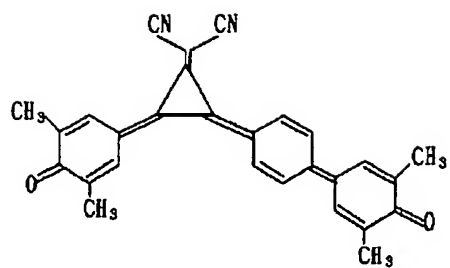
A - 4



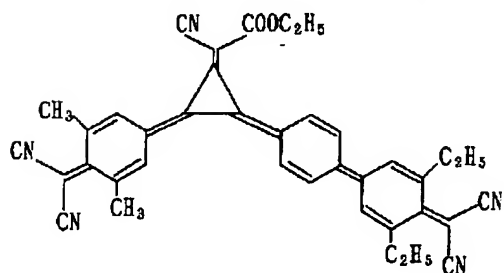
[0043]

[Formula 16]

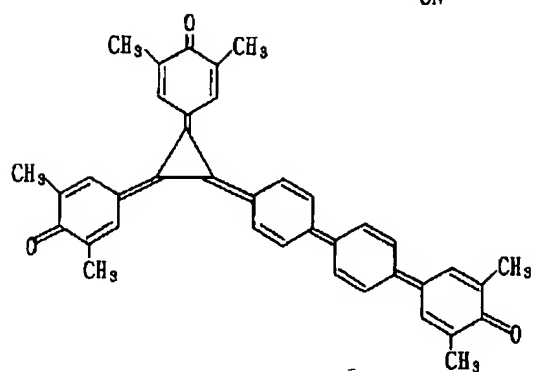
A - 5



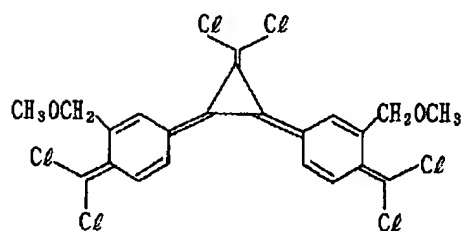
A - 6



A - 7



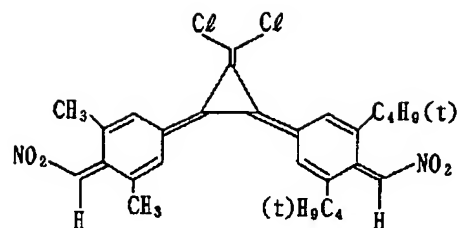
A - 8



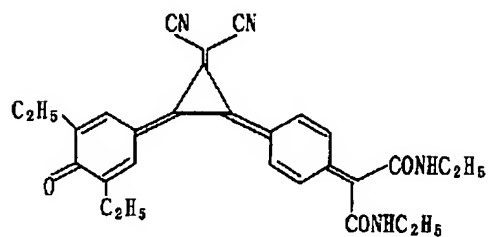
[0044]

[Formula 17]

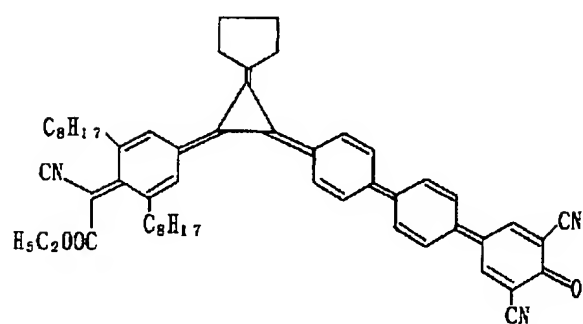
A - 9



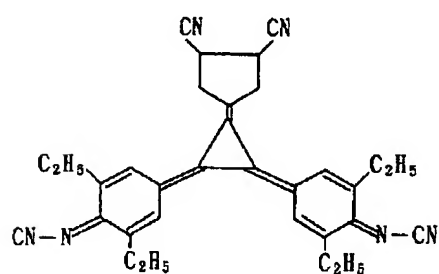
A - 10



A - 11



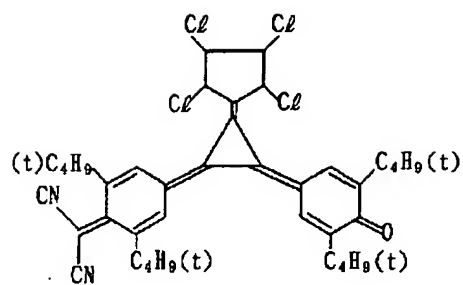
A - 12



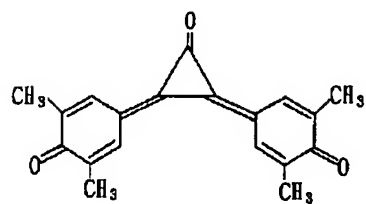
[0045]

[Formula 18]

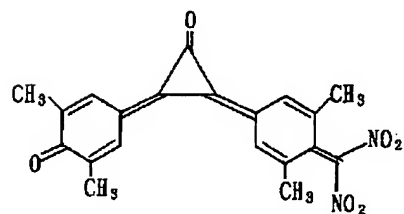
A - 13



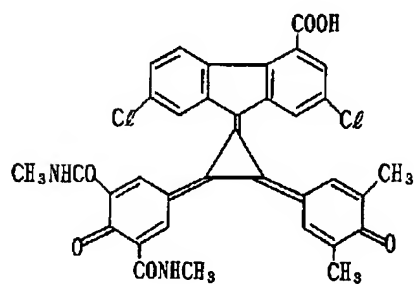
A - 14



A - 15



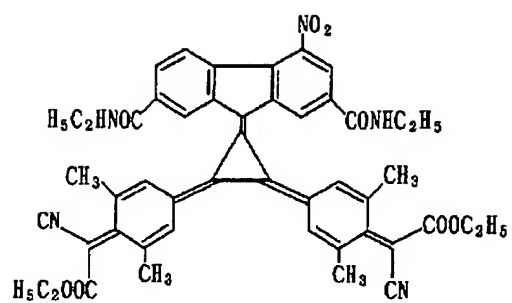
A - 16



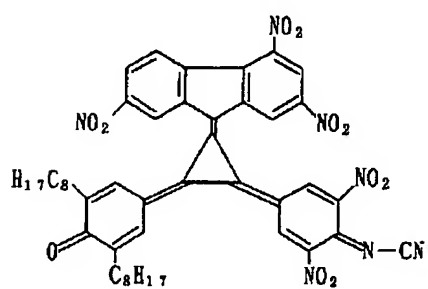
[0046]

[Formula 19]

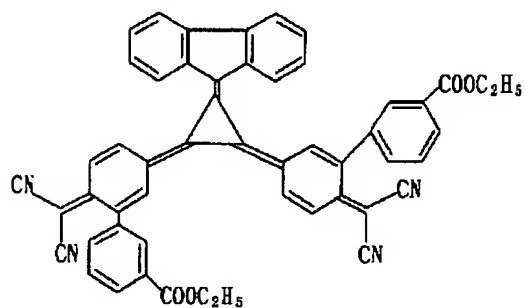
A - 17



A - 18



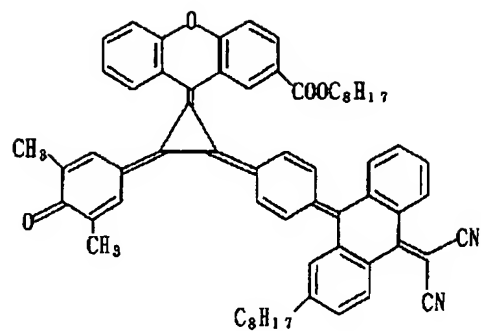
A - 19



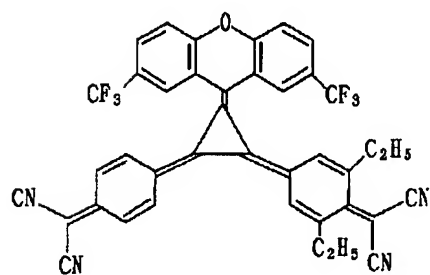
[0047]

[Formula 20]

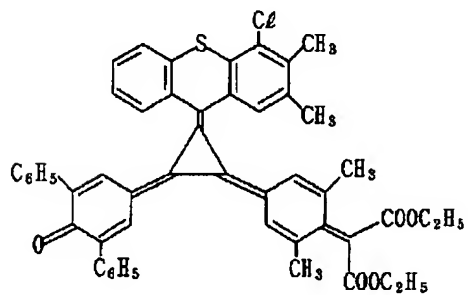
A - 20



A - 21



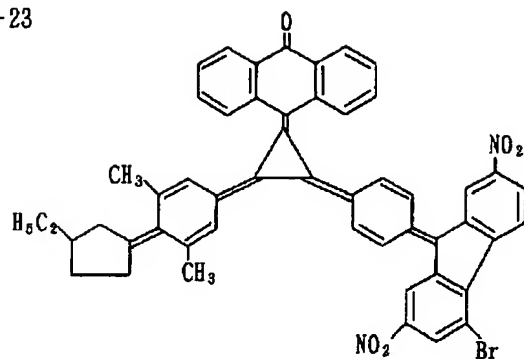
A - 22



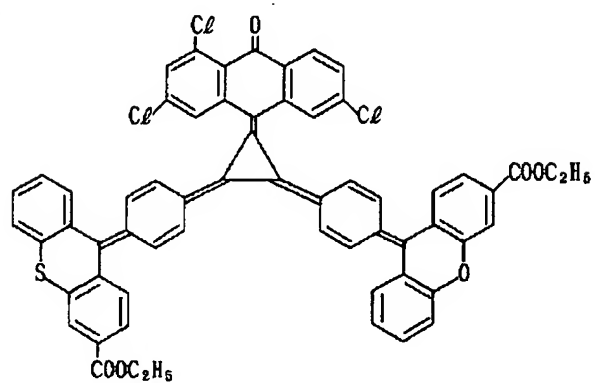
[0048]

[Formula 21]

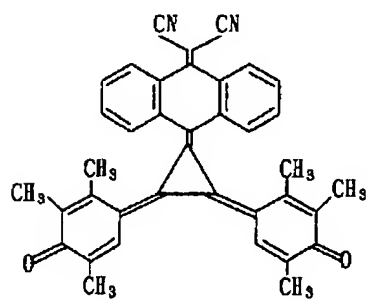
A - 23



A - 24



A - 25

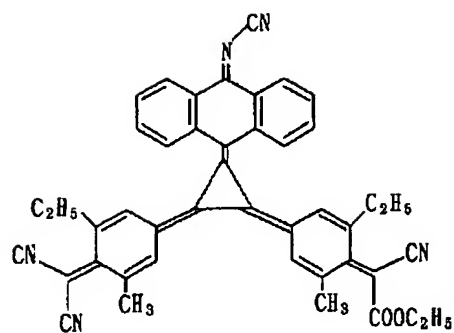


[0049]

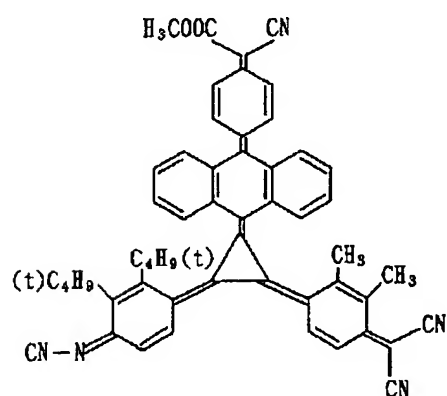
[Formula 22]



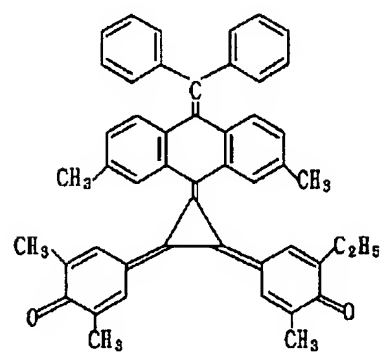
A - 26



A - 27



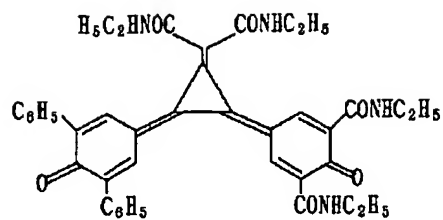
A - 28



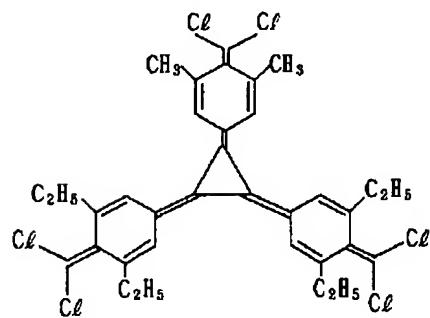
[0050]

[Formula 23]

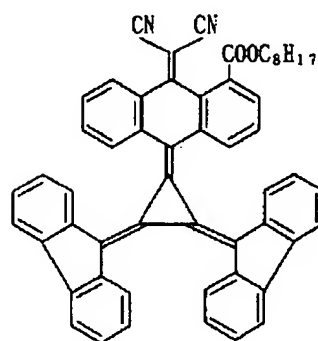
A - 29



A - 30



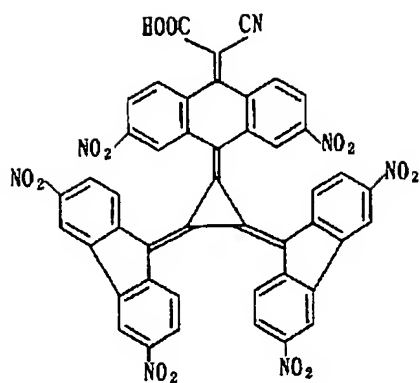
A - 31



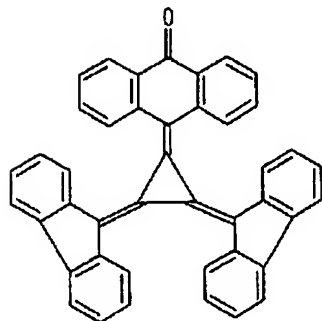
[0051]

[Formula 24]

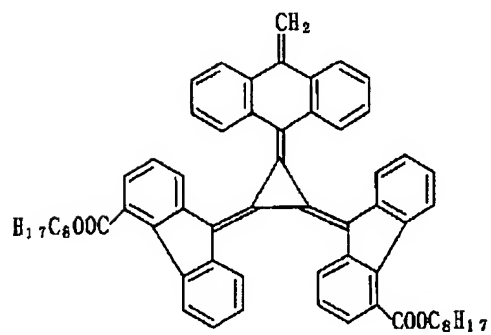
A - 32



A - 33



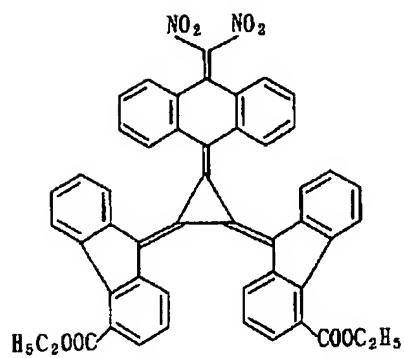
A - 34



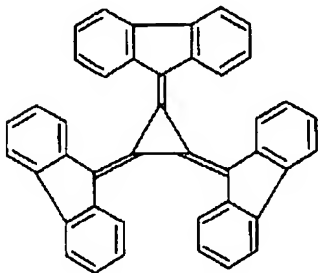
[0052]

[Formula 25]

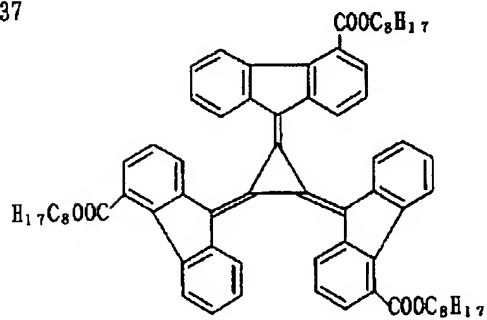
A - 35



A - 36



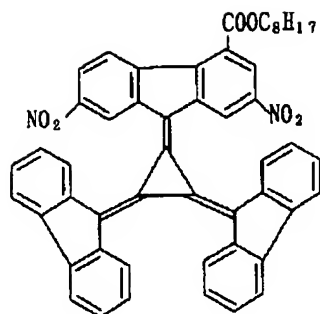
A - 37



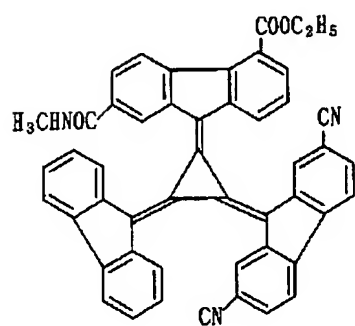
[0053]

[Formula 26]

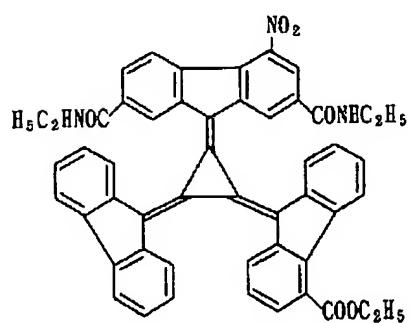
A - 38



A - 39



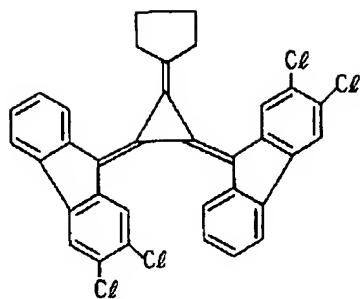
A - 40



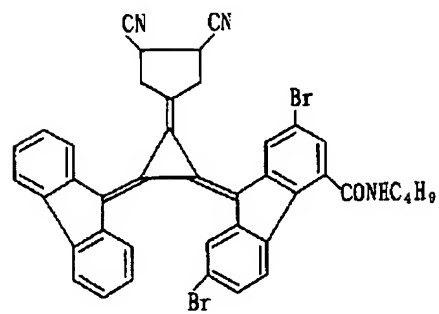
[0054]

[Formula 27]

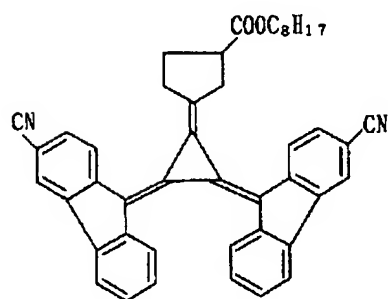
A-41



A-42

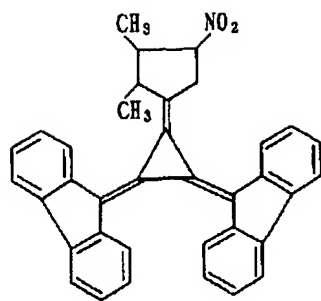


A-43

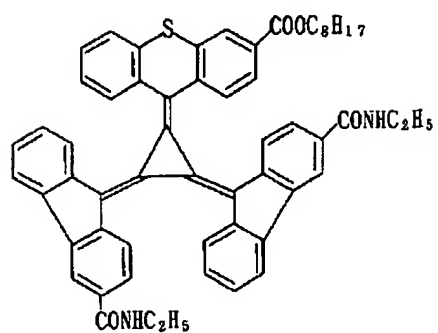


[0055]  
[Formula 28]

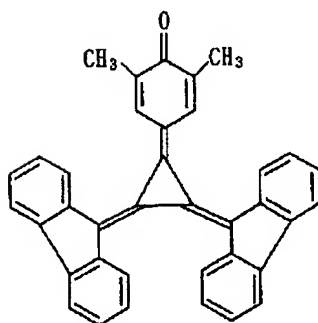
A - 44



A - 45

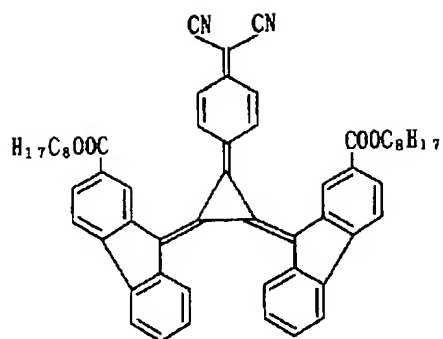


A - 46

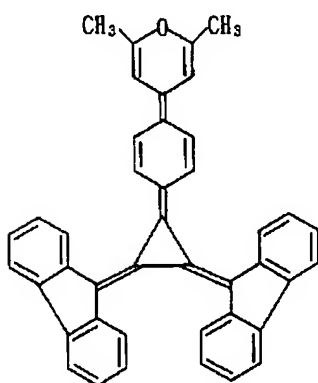


[0056]  
[Formula 29]

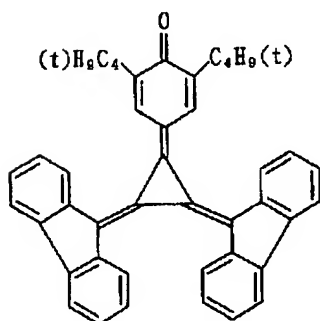
A-47



A-48



A-49

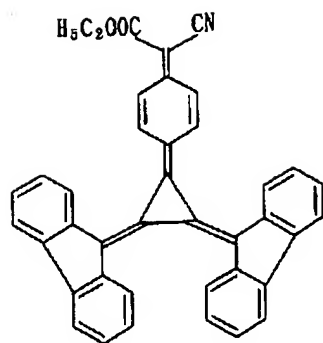


[0057]

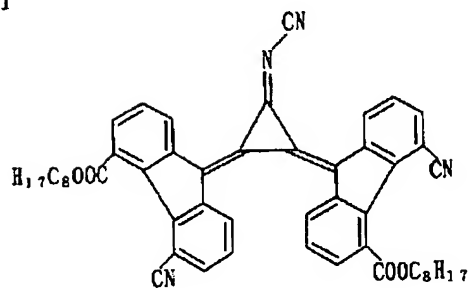
[Formula 30]



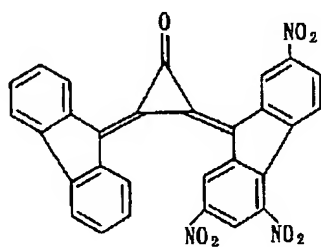
A-50



A-51

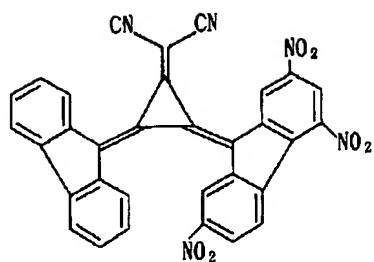


A-52

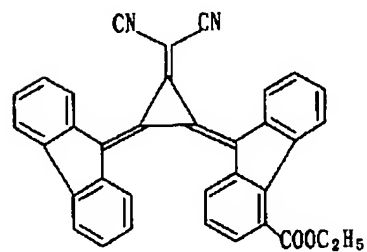


[0058]  
[Formula 31]

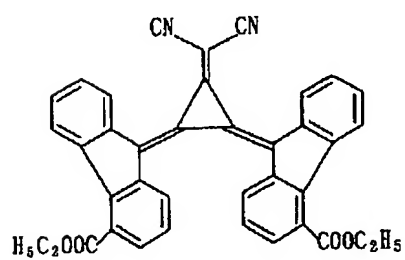
A-53



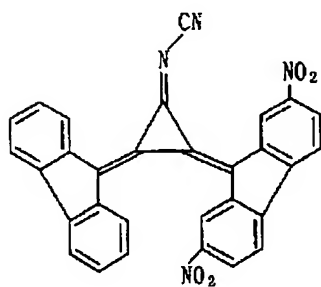
A-54



A-55



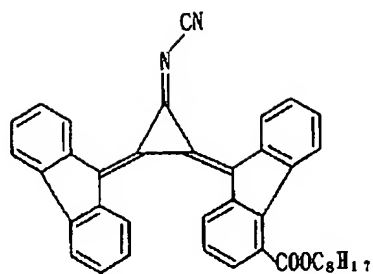
A-56



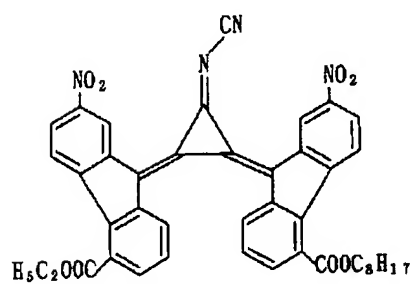
[0059]

[Formula 32]

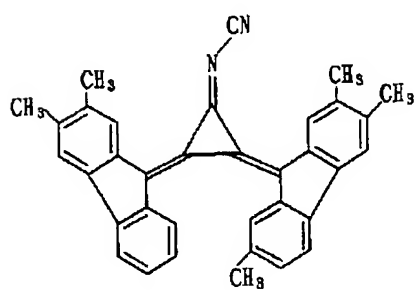
A-57



A-58

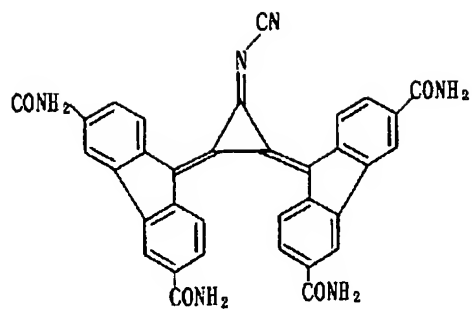


A-59

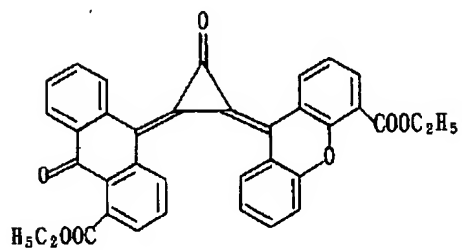


[0060]  
[Formula 33]

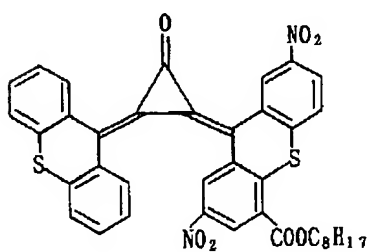
A - 60



A - 61



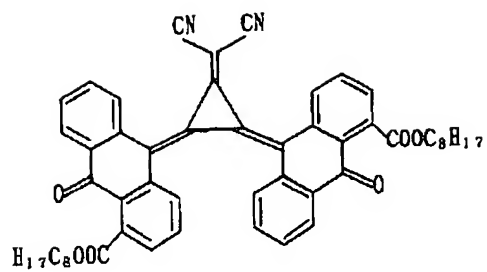
A - 62



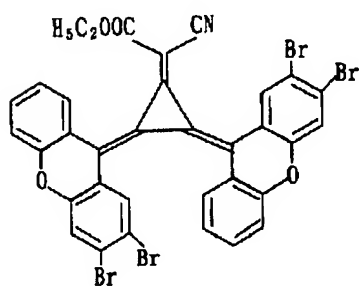
[0061]

[Formula 34]

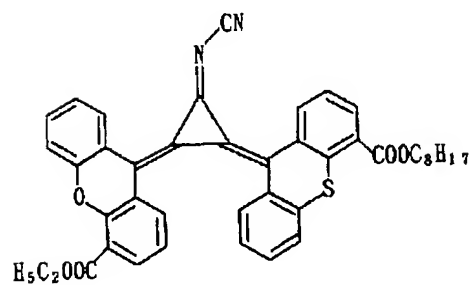
A - 63



A - 64



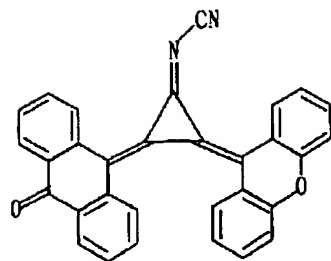
A - 65



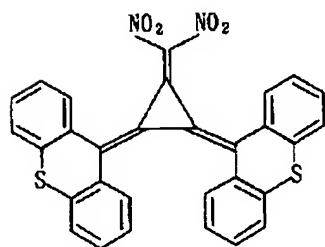
[0062]

[Formula 35]

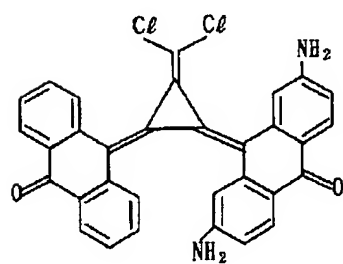
A - 66



A - 67



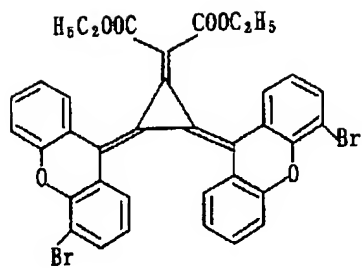
A - 68



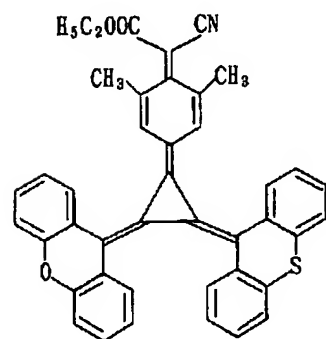
[0063]

[Formula 36]

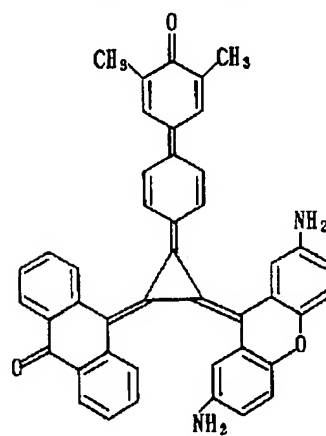
A - 69



A - 70



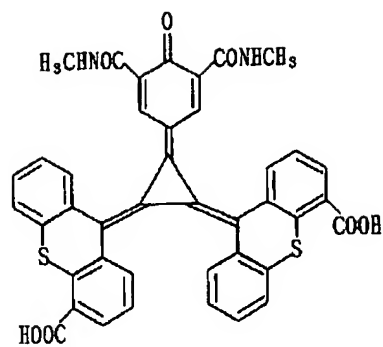
A - 71



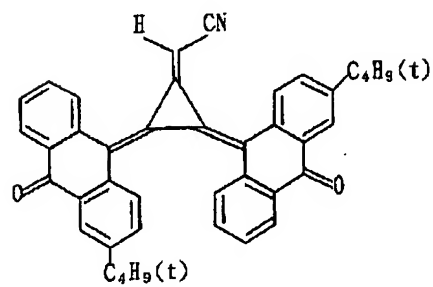
[0064]

[Formula 37]

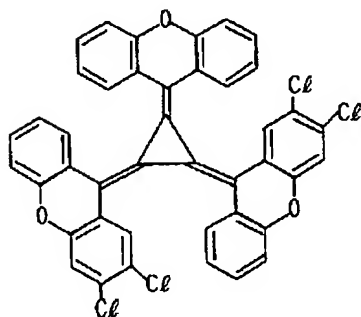
A - 72



A - 73



A - 74

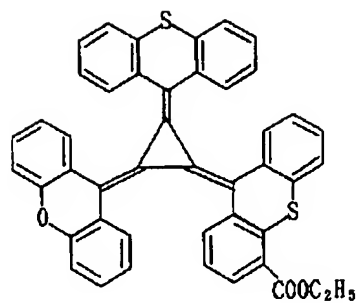


[0065]

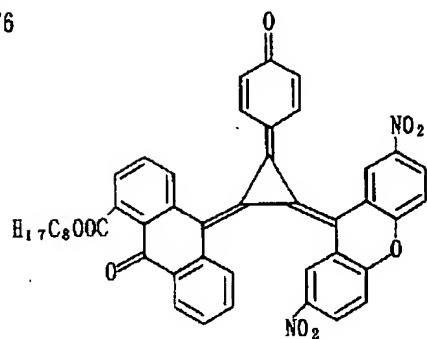
[Formula 38]



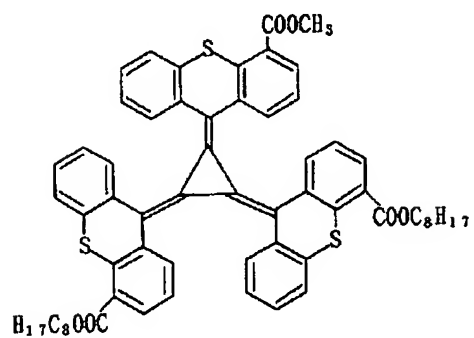
A - 75



A - 76



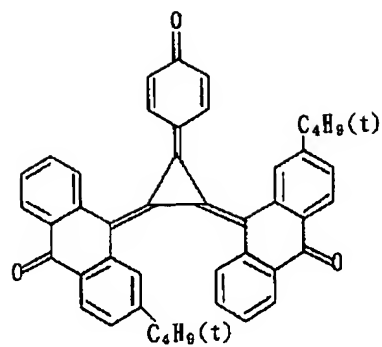
A - 77



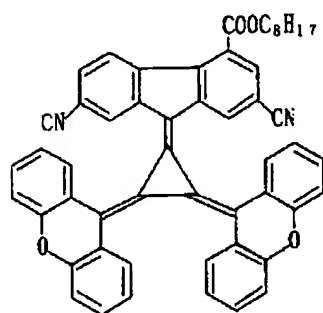
[0066]

[Formula 39]

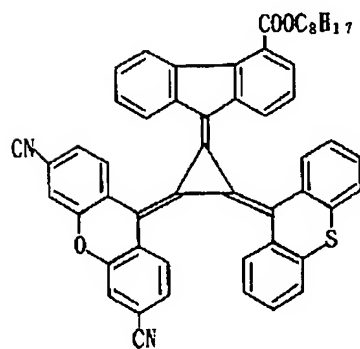
A-78



A-79



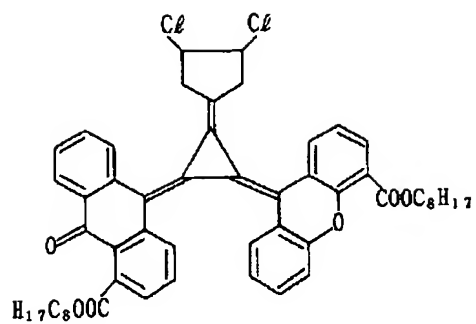
A-80



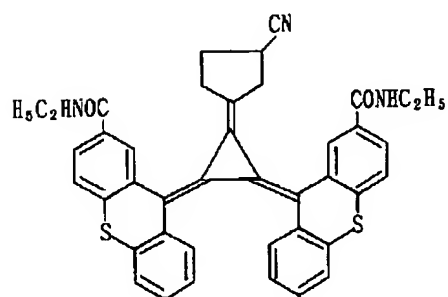
[0067]

[Formula 40]

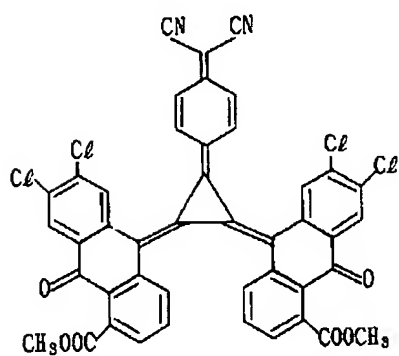
A - 81



A - 82



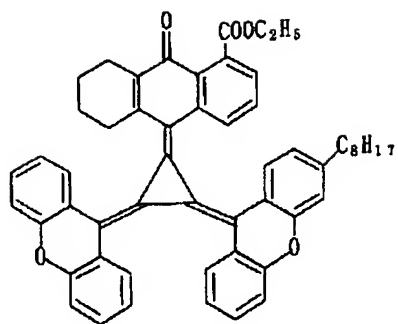
A - 83



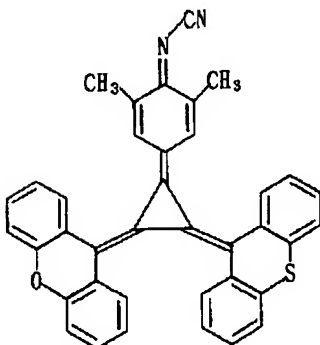
[0068]

[Formula 41]

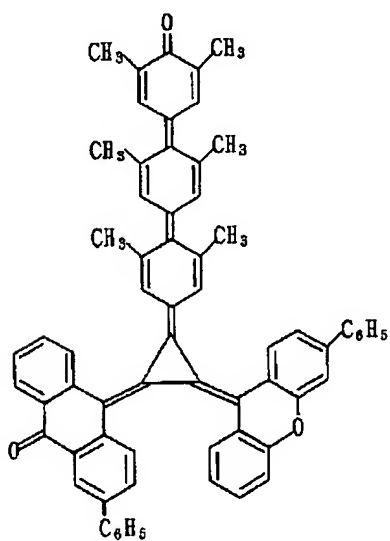
A-84



A-85



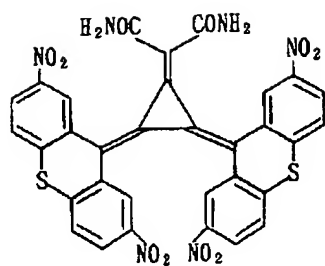
A-86



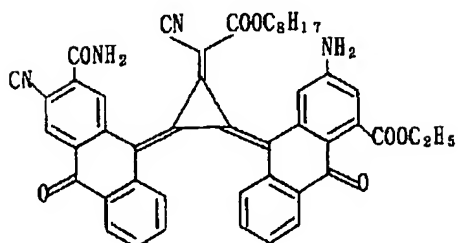
[0069]

[Formula 42]

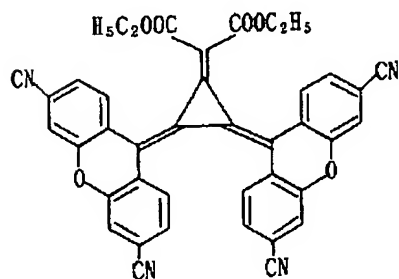
A - 87



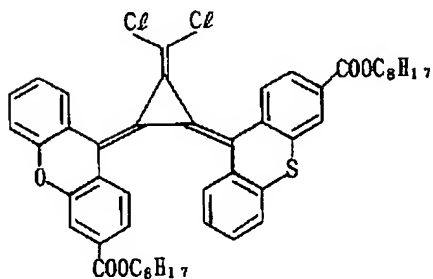
A - 88



A - 89

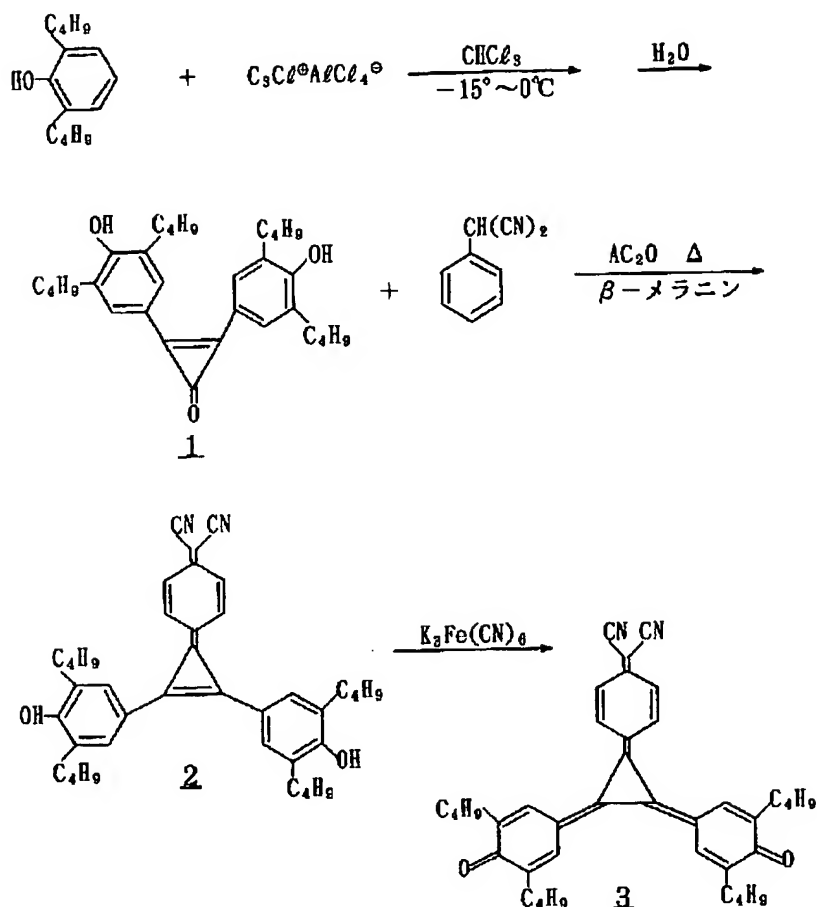


A - 90



[0070] : Synthetic example : [0071]

[Formula 43]



例示化合物 A - 1

[0072] The instantiation compound A-1 was compounded according to the above-mentioned scheme. Namely, 10g (0.075 mols) of aluminum chlorides, tetrapod crawl cyclopropene 13.4g (0.075 mols), and 10ml of methylene chlorides were put into the 300ml four-animal flask, and it heated to reflux under the nitrogen air current, and agitated for 2 hours.

[0073] Then, the reaction mixture was cooled to -15 degrees C, 10ml of methylene chlorides was added, and 2 and 6-tert-butylphenol 30.9g (0.15 mols) melted to 75ml methylene chloride was added further. Reaction temperature held for -10 degrees C - 5 degrees C, and agitated it for 1 hour.

[0074] Then, 100ml of pure water was added, the organic layer was separated, the methylene-chloride layer was dried by  $\text{Na}_2\text{SO}_4$ , reduced pressure distilling off of the methylene chloride was carried out, and the rough crystal of 1 was obtained. This was recrystallized in ethyl ether 100ml, and 1 [ 22.2g (Y64%) ] was obtained as the white crystal.

[0075] Next, 1 1.34g (2.9mmol), phenyl MARONO nitril 0.75g (5.3mmol), 0.01g of beta alanines, and 3.5ml of acetic anhydrides are put into a 50ml four-animal flask, and it agitates at reflux temperature for 15 minutes.

[0076] Then, the reaction was cooled and the orange rough crystal was obtained. This rough crystal was recrystallized in chlorobenzene and 2 [ 1.27g (Y74.7%) ] was obtained as the orange crystal.

[0077] Then, the organic layer was separated, the organic layer was rinsed further, the benzene layer was dried by  $\text{MgSO}_4$ , reduced pressure distilling off of the benzene was carried out, and B-10.62g of instantiation compounds was obtained at 91% of yield as a crystal of a blue-purple color. The melting point is 270 degrees C.

[0078] Since the elemental-analysis value was in agreement with calculated value, the structure of the instantiation compound A-1 was checked.

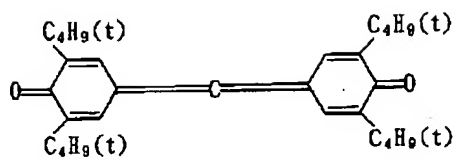
[0079]

Elemental-analysis data C H N Measured value 84.05 (%) 7.11 4.11 Calculated value 84.16 7.07 The compound expressed with 4.09 (B) general formulas [B]: Instantiation compound : [0080]

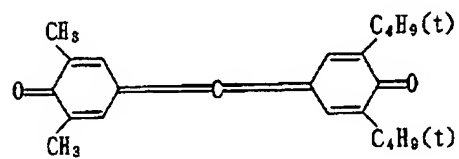
[Formula 44]

例示化合物 B

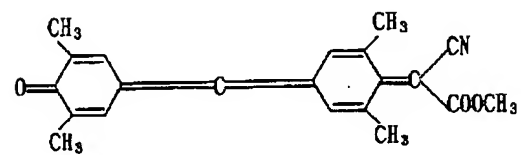
B-1



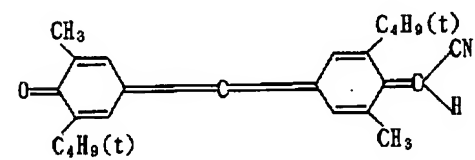
B - 2



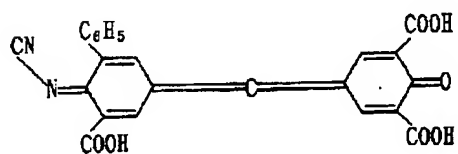
**B - 3**



B-4



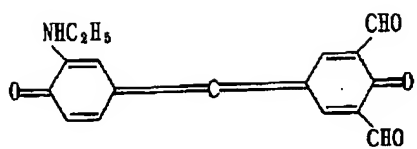
B-5



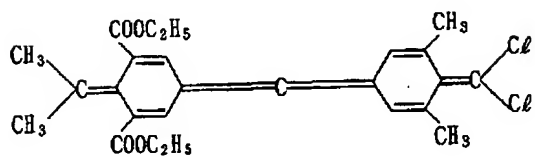
[0081]

[Formula 45]

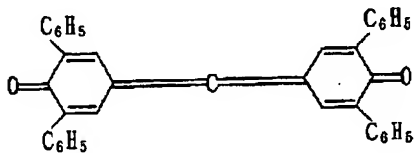
B - 6



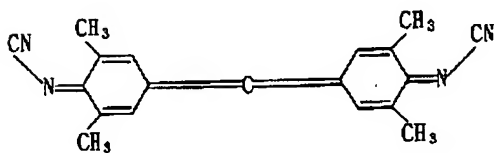
B - 7



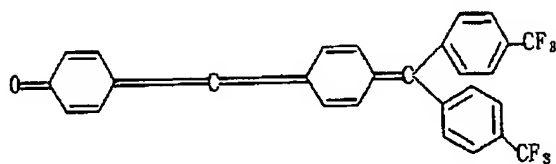
B - 8



B - 9



B - 10

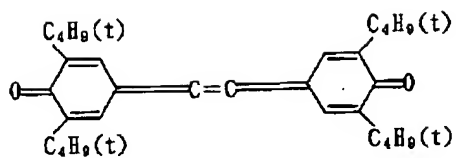


[0082]

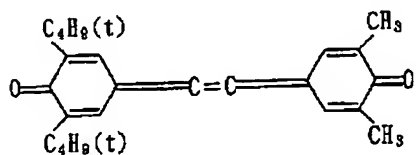
[Formula 46]



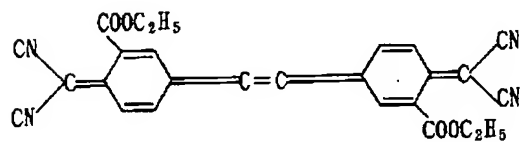
B - 11



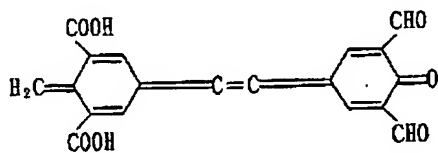
B - 12



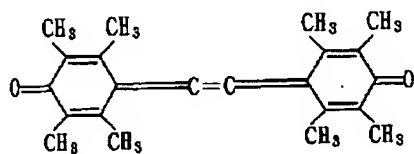
B - 13



B - 14



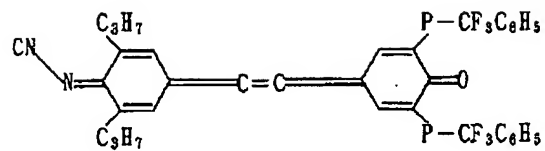
B - 15



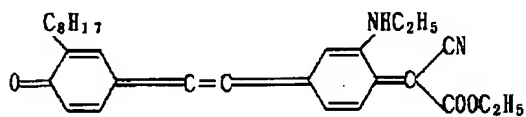
[0083]

[Formula 47]

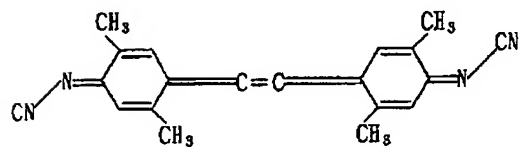
B - 16



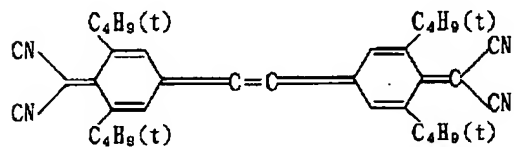
B - 17



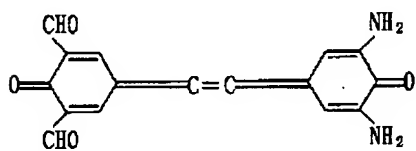
B - 18



B - 19



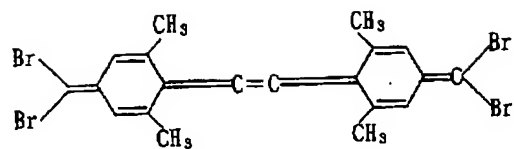
B - 20



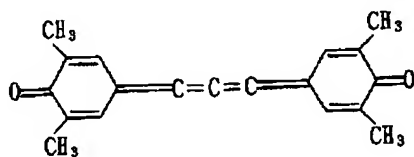
[0084]

[Formula 48]

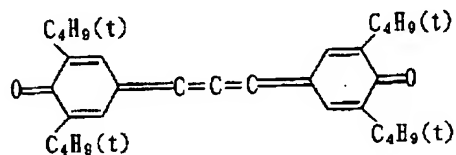
B - 21



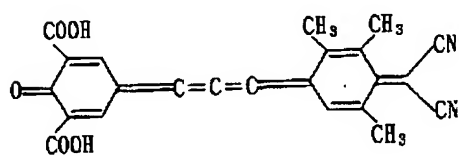
B - 22



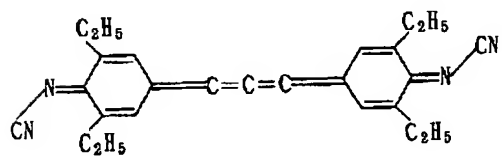
B - 23



B - 24



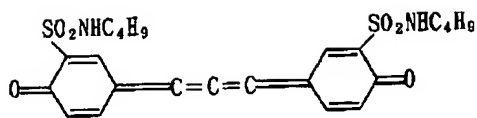
B - 25



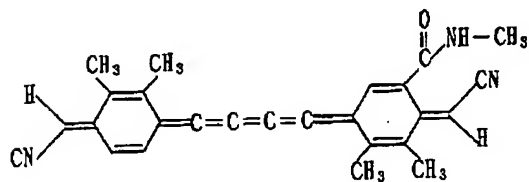
[0085]

[Formula 49]

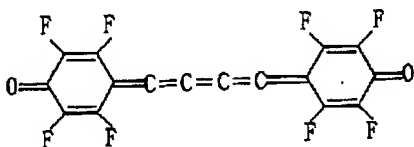
B - 26



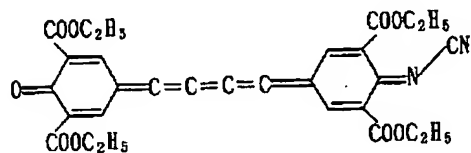
B - 27



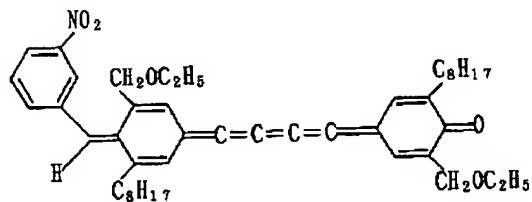
B - 28



B - 29

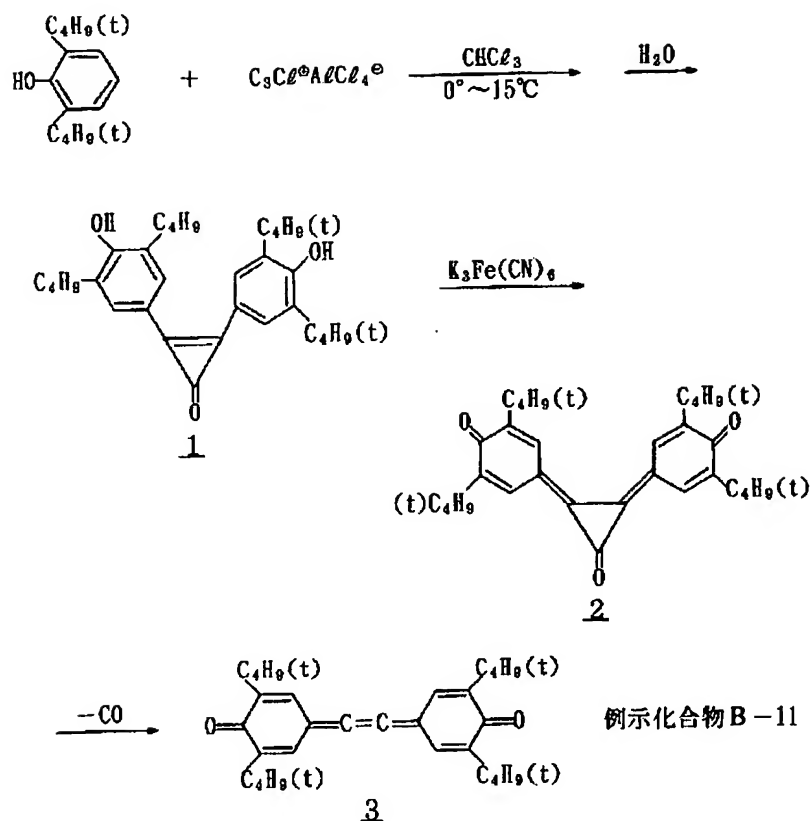


B - 30



[0086] : Synthetic example : [0087]

[Formula 50]



[0088] The instantiation compound B-11 was compounded according to the above-mentioned scheme. namely, 10g (0.075 mols) of aluminum chlorides, tetrapod crawl cyclo propene 13.4g (0.075 mols), and 10ml of methylene chlorides -- a 300ml four-animal flask -- putting in -- the bottom of a nitrogen air current, and reflux temperature -- it agitated for 2 hours

[0089] Then, the reaction mixture was cooled to -15 degrees C, 10ml of methylene chlorides was added, and 2 and 6-tert-butylphenol 30.9g (0.15 mols) melted to 75ml methylene chloride was added further. Reaction temperature had for -10 degrees C - 5 degrees C, and agitated it for 1 hour.

[0090] Then, 100ml of pure water was added, the organic layer was separated, the methylene-chloride layer was dried by Na<sub>2</sub>SO<sub>4</sub>, reduced pressure distilling off of the methylene chloride was carried out, and the rough crystal of 1 was obtained. This was recrystallized in ethyl ether 100ml, and 1 [ 22.2g (Y64%) ] was obtained as the white crystal.

[0091] Next, 21.4g (0.065 mols) of potassium ferricyanide melted in 11.6g (0.025mmol), 11. of benzene, and the 11. 0.1MKOH solution is put into a 3l. four-animal flask, and it agitates at a room temperature for 1 hour.

[0092] Then, the organic layer was separated, it rinsed still better, the benzene layer was dried by MgSO<sub>4</sub>, reduced pressure distilling off of the benzene was carried out, and two crystals of a Purple color were obtained.

[0093] Finally the rough crystal of 2 and benzene 500ml are agitated at \*\* and 40-degree-C temperature in a three-animal flask for 45 minutes. After putting several more hours, reduced pressure distilling off of the benzene was carried out, and the purple \*\*\*\* crystal was obtained. This rough crystal was recrystallized in the acetonitrile and instantiation compound P-11 9.06g was obtained at 84% of yield as a crystal of a purple color.

[0094] Since the elemental-analysis value was in agreement with calculated value, the structure of the instantiation compound B-11 was checked.

[0095]

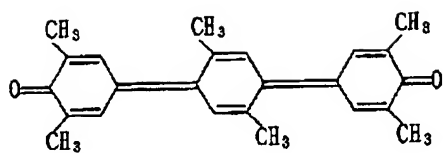
元素分析データ	C	H
測定値	83.17 (%)	9.34
計算値	83.33	9.26

(C) The compound expressed with a general formula [C] : instantiation compound : [0096]

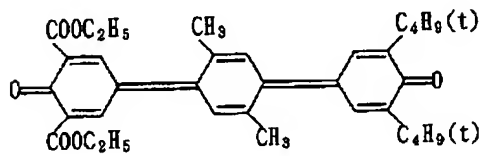
[Formula 51]

## 例示化合物 C

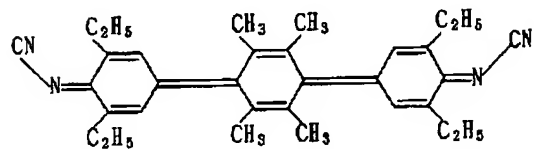
C - 1



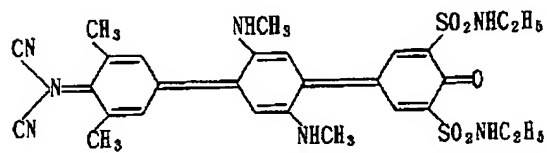
C - 2



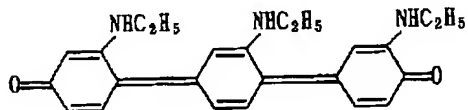
C - 3



C - 4



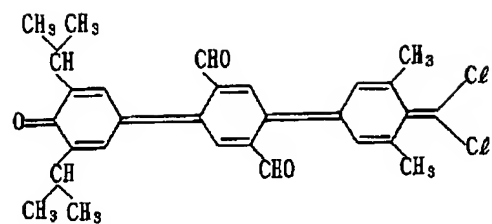
C - 5



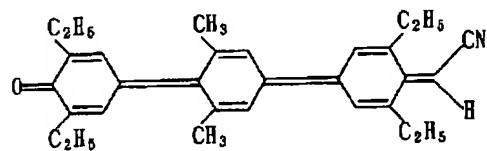
[0097]

[Formula 52]

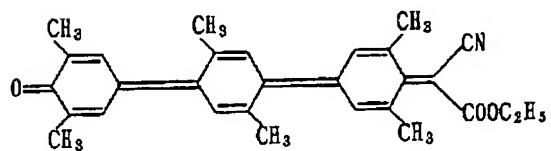
C - 6



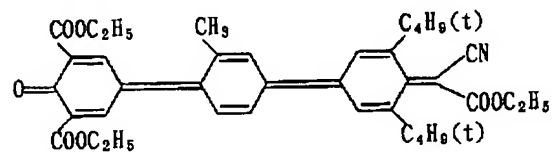
C - 7



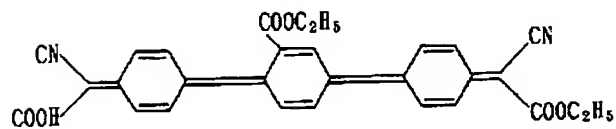
C - 8



C - 9



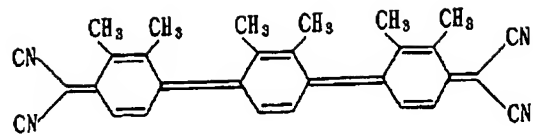
C - 10



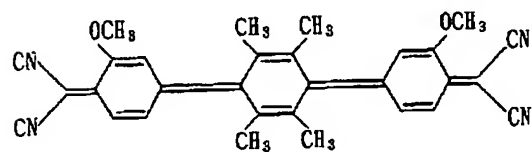
[0098]

[Formula 53]

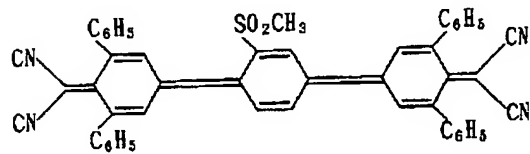
C - 11



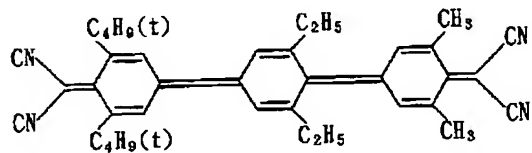
C - 12



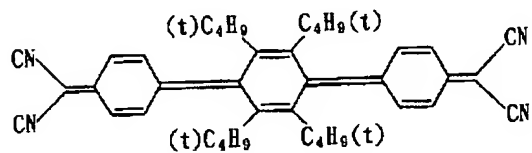
C - 13



C - 14



C - 15

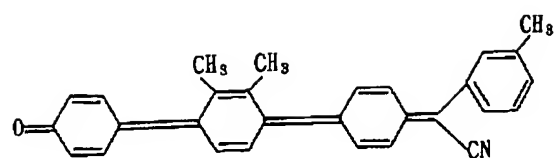


[0099]

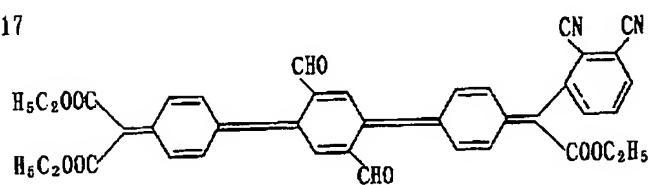
[Formula 54]



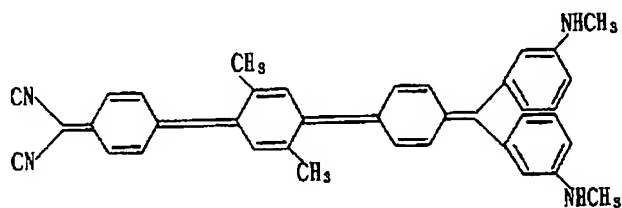
C - 16



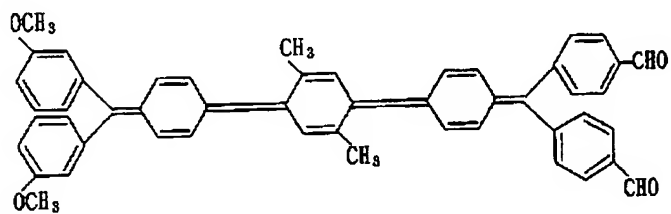
C - 17



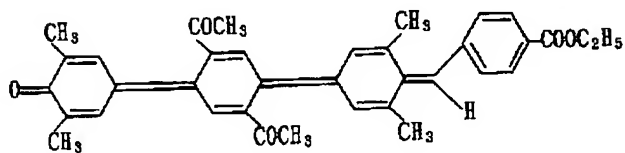
C - 18



C - 19



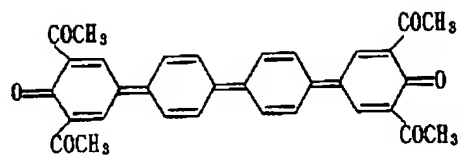
C - 20



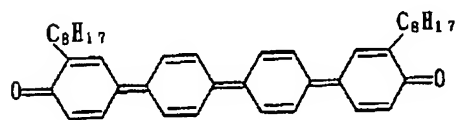
[0100]

[Formula 55]

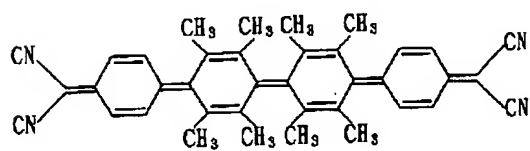
C-21



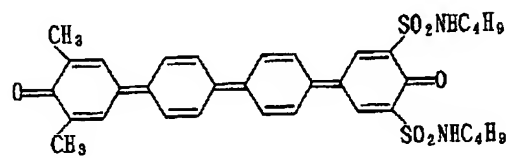
C-22



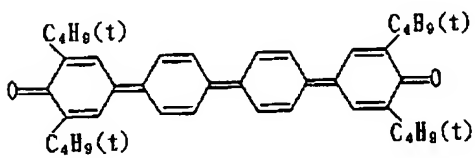
C-23



C-24



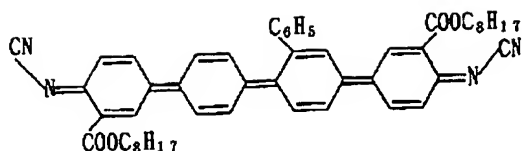
C - 25



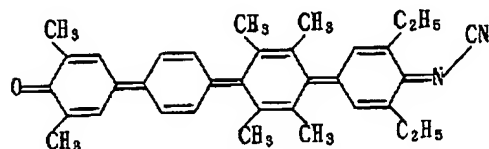
[0101]

[Formula 56]

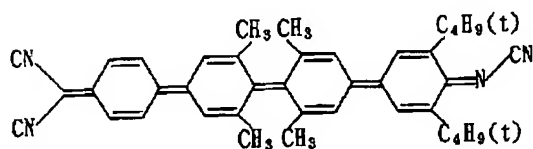
C - 26



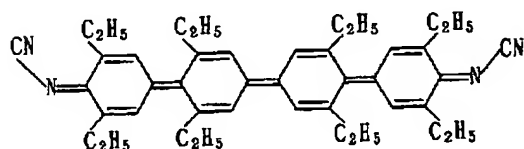
C - 27



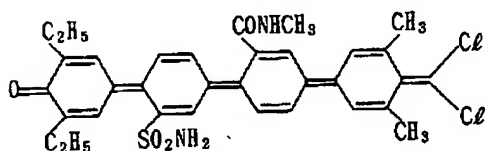
C - 28



C - 29



C - 30



[0102] : A synthetic example : the instantiation compound C-1 was compounded according to Angewante Chemistry 75,860 (1963) reference.

[0103] Since the elemental-analysis value was in agreement with calculated value, the structure of the instantiation compound C-1 was checked.

[0104]

元素分析データ	C	H
測定値	83.44 (%)	7.16
計算値	83.68	7.02

In the electrophotography photo conductor of this invention, a high polymer film or paper covered with the high polymer film which prepared the vacuum evaporatio layer of metals, such as a metallic pipe, a metal plate, a metal sheet, a metallic foil, a high polymer film that performed electric conduction processing, and aluminum, as a conductive base material, for example, a metallic oxide, quarternary ammonium salt, etc. is used.

[0105] In the electrophotography photo conductor of this invention, although a photosensitive layer is prepared on a conductive base material, monolayer structure is sufficient as a photosensitive layer, and the thing of the laminated structure by which functional separation was carried out at the charge generating layer and the electronic transporting bed is sufficient as it. Moreover, you may prepare a glue line between a conductive base material and a photosensitive layer.

[0106] As shown in drawing 1 (a) and (b), as for the photo conductor of this invention, the photosensitive layer 4 which consists of the layered product of the charge generating layer (CGL) 2 which makes the charge generating matter (CGM) a principal component, and the electronic transporting bed (CTL) 3 which contains the electronic transportation matter (coal tar mixture) as a principal component is formed on the conductive base material 1. As shown in this drawing (c) and (d), you may form this photosensitive layer 4 through the interlayer 5 who prepared on the conductive

base material 1. Thus, when a photosensitive layer 4 is considered as bilayer composition, the photo conductor which has the most excellent electrophotography property is obtained. Moreover, in this invention, you may form the photosensitive layer 4 which comes to distribute particle-like CGM7 through direct or an interlayer 5 on the conductive base material 1 into the layer 6 which makes Above coal tar mixture a principal component as shown in drawing 1 (e) and (f).

[0107] Furthermore, on the aforementioned photosensitive layer 4, you may prepare a protective layer (OCL) if needed.

[0108] Moreover, CGL2 and CTL3 which constitute the photosensitive layer 4 of bilayer composition prepared interlayers, such as a glue line or a barrier layer, if needed on the conductive base material 1 used as a lower layer side, and also [ direct or ] they can form them by the following method the property of coal tar mixture and CGM.

[0109] (1) the gaseous-phase depositing method (2) paint applying method a -- the method of applying the solution paint which dissolved CGM and coal tar mixture in the suitable solvent

[0110] b) How to apply the dispersion-liquid paint obtained by making CGM and coal tar mixture into the shape of a very fine particle in a dispersion medium by the ball mill, the homomixer, etc., and carrying out mixed distribution with a binder if needed.

[0111] A vacuum deposition method, the sputtering method, the ion play TENGU method, or CVD is mentioned to the aforementioned gaseous-phase depositing method, and a suitable method is chosen as the paint applying method according to the physical properties of paints, such as a dipping method, a spray method, the air doctor method, a doctor blade method, and the reverse rolling method.

[0112] Vacuum evaporatio films, such as a thing which applied what distributed in the resin low resistance compounds, such as what was formed by the resin independent, a tin oxide, indium oxide, and titanium oxide, or an aluminum oxide, a zinc oxide, and oxidization silicon, are sufficient as a glue line. As a resin used for a glue line, although there is especially no limit, fusibility polyamide resin a vinylidene-chloride-vinyl chloride copolymer, water-soluble polyvinyl butyral resin, and alcoholic, a vinyl acetate system resin, polyvinyl alcohol, a nitrocellulose, polyimide resin, etc. are mentioned.

[0113] The thickness of a binding layer has desirable about 0.01-10 micrometers, and its 0.01-1 micrometer is especially desirable.

[0114] When a photosensitive layer is a monolayer, the thing which made the compound shown by above-mentioned general formula [A]- [C] in the photosensitive layer which consisted of well-known material, such as a polyvinyl carbazole, contain as a sensitizer, or the thing which made the compound shown by above-mentioned general formula [A]- [C] in the photosensitive layer containing the well-known charge generating matter contain as electronic transportation matter is mentioned.

[0115] On the other hand, when a photosensitive layer is a laminating type, the charge generating layer carried out the vacuum evaporatio of the electronic generating matter on the electric conduction base material, could be obtained, and may be formed by applying the application liquid which makes the charge generating matter and a bending resin a principal component.

[0116] A thing like a well-known throat as the charge generating matter and a binding resin can also be used.

[0117] For example, as charge generating matter, organic pigments, such as organic semiconductors, such as inorganic semiconductors, such as Te-Se, and a polyvinyl carbazole, a screw azo system compound, a tris azo system compound, a non-metal phthalocyanine system compound, a metal phthalocyanine system compound, a pyrylium system compound, a square RIUMU system compound, a cyanine system compound, a perylene system compound, and a polycyclic quinone system compound, can be used. Y type titanylphthalocyanine pigment which has an X diffraction peak at 27.2 degrees of JP,64-17066,A as desirable charge generating matter especially, for example, A type titanylphthalocyanine pigment which has an X diffraction peak at 26.3 degrees of JP,62-67094,A, B type titanylphthalocyanine pigment which has the X diffraction peak of JP,61-239248,A at 28.7 degrees, The non-metal phthalocyanine pigment of JP,49-4338,B, the copper-phthalocyanine pigment of JP,57-163239,A, There are a vanadyl phthalocyanine pigment of JP,57-148747,A, a perylene pigment of JP,49-128734,A, a condensation polycyclic pigment of JP,47-18544,A, a screw azo pigment of JP,1-150145,A, etc. Moreover, as a binding resin, polystyrene, silicone resin, polycarbonate resin, acrylic resin, methacrylic resin, polyester, a vinyl system polymer, a cellulose system resin, a butyral system resin, a silicone denaturation butyral resin, an alkyd resin, etc. can be used.

[0118] The thickness of an electronic generating layer has desirable about 0.01-10 micrometers, and its 0.05-2 micrometers are especially desirable.

[0119] An electronic transporting bed is formed on a charge generating layer. This electronic transporting bed is formed by applying the compound which consists of the compounds and binding resins which are shown by above-mentioned general formula [A]- [C], and is shown by above-mentioned general formula [A]- [C], a binding resin, and the application liquid which makes a suitable solvent a principal component on a charge generating layer by the applicator,

the bar coating machine, the dip coater, etc. In this case, as for the mixing ratio of various compounds and a binding resin, 1:100-100:1 are desirable, and especially 1:20-20:1 are desirable.

[0120] As a binding resin used for an electronic transporting bed, if well-known, anythings can be used. As a binding resin, for example, an acrylonitrile-butadiene copolymer, A styrene-butadiene copolymer, a vinyltoluene-styrene copolymer, A styrene denaturation alkyd resin, a silicone denaturation alkyd resin, a soybean-oil denaturation alkyd resin, Vinylidene-chloride-vinyl chloride resin, a polyvinyl butyral, nitration polystyrene, The poly methyl styrene, a polyisoprene, polyester, phenol resin, The Kent resin, a polyamide, a polycarbonate, poly thio carbonate, a polyacrylate, poly halo acrylate, a vinyl acetate system resin, polystyrene, the poly allyl-compound ether, polyvinyl acrylate, a polysulfone, a polymethacrylate, etc. are mentioned. Especially a biphenyl Z type polycarbonate is desirable especially. Moreover, the electron-donative matter may be added to an electronic transporting bed, and an amphipathy photo conductor may be produced.

[0121] Furthermore, you may add an antioxidant and a radical trap agent to an electronic transporting bed.

[0122] The thickness of an electronic transporting bed has desirable 2-100 micrometers, and its 5-50 micrometers are especially desirable.

[0123] In addition, in the electrophotography photo conductor of this invention, you may prepare a barrier layer on a conductive base material. The barrier layer is effective in order to prevent pouring of the unnecessary charge from a conductive base material, and it has the operation which raises quality of image. As a material which forms a barrier layer, there are metallic oxides, such as an aluminum oxide, or acrylic resin, phenol resin, polyester resin, polyurethane, etc. A barrier layer may be prepared on a glue line, and may be prepared in the bottom.

[0124]

[Example] Next, an example explains this invention concretely. The "weight section" is expressed in this example as the "section."

[0125] (I) An interlayer with a thickness of 0.5 micrometers it is thin from polyamide resin "CM8000" (Toray Industries, Inc. make) is prepared on the PET film which deposited the sensitivity-evaluation example 1 - 30 aluminum. The perylene pigment G-1 1 section, the polyvinyl-butyril-resin "S REKKU BMS" (Sekisui Chemical Co., Ltd. make) 0.2 section which are shown in "-izing 57" on it, The liquid which distributed the methyl-ethyl-ketone 50 section, using a sand mill as a dispersion medium was applied using the wire bar, and the charge generating layer of 0.3 micrometers of thickness was formed. Subsequently, the instantiation compound 1 section and the polycarbonate resin "you pyrone Z-200" (Mitsubishi Gas Chemical Co., Inc. make) 1.5 section which are shown in Tables 1-3 were dissolved in the tetrahydrofuran (THF) 10 section, on the charge generating layer, the blade application was carried out and the electronic transporting bed of 20 micrometers of thickness was formed.

[0126] The comparison sample was created like the example 1 except having used the comparison compound 1 shown in "-izing 57" instead of an example of comparison 1 instantiation compound.

[0127] +800V were electrified using electrostatic tracing paper testing-device EPA-8100 (the Kawaguchi electrical-and-electric-equipment company make) about the electrophotography photo conductor sample obtained by evaluation 1 examples 1-30 and the example 1 of comparison, the white light of 10 lux was exposed, light exposure until surface potential becomes half was calculated, and it considered as sensitivity. A result is shown in Tables 1-3.

[0128] (II) An interlayer with a thickness of 0.5 micrometers it is thin from polyamide resin "X-1874M" (DAISERU Huels make) is prepared on the PET film which deposited the durability evaluation example 31 - 60 aluminum. On it The pigment X type non-metal phthalocyanine (Dainippon Ink make) 1 section, The polyvinyl-butyril-resin "S REKKU BX-1" (Sekisui Chemical Co., Ltd. make) 0.4 section and the liquid which distributed the methyl-isopropyl-ketone 50 section, using a sand mill as a dispersion medium were applied using the wire bar, and the charge generating layer of 0.3 micrometers of thickness was formed. Subsequently, the instantiation compound 1 section of Tables 4-6 and the polycarbonate resin "you pyrone Z-200" (Mitsubishi Gas Chemical Co., Inc. make) 1.5 section were dissolved in the THF10 section, on the charge generating layer, the blade application was carried out and the electronic transporting bed of 20 micrometers of thickness was formed.

[0129] The comparison sample was created like the example 31 except having used the comparison compound 2 shown in "-izing 57" instead of an example of comparison 2 instantiation compound.

[0130] The "(Konica Corp. make )U-Bix1017" reconstruction machine estimated the electrophotography photo conductor sample obtained by evaluation 2 examples 31-60 and the example 2 of comparison with the following actual measurements after the first stage and a 10000-sheet copy. A result is shown in Tables 4-6.

[0131] Vb: Black section potential Vw: White section potential Vr : An interlayer with a thickness of 0.5 micrometers it is thin from polyamide resin "CM8000" (Toray Industries, Inc. make) is prepared on the rest-potential (III) quality-of-image evaluation example 61 - 90 cylindrical-shape aluminum base. 9.5 degrees of Bragg angle  $2\theta$  [ in / an X diffraction / moreover ], 24.1 degrees, The DIP application of the liquid which distributed the methyl-isopropyl-ketone

50 section at 27.2 degrees, using a sand mill as the CHITANIN phthalocyanine 1 section which has a peak, and a silicone butyral-resin 0.5 section dispersion medium was carried out, and the charge generating layer of 0.3 micrometers of thickness was formed. Subsequently, the instantiation compound 1 section and the polycarbonate resin "you pyrone Z-200" (Mitsubishi Gas Chemical Co., Inc. make) 1.5 section which are shown in Tables 7-9 were dissolved in the THF10 section, on the charge generating layer, the DIP application was carried out and the electronic transporting bed of 20 micrometers of thickness was formed.

[0132] The comparison sample was created like the example 61 except having used the comparison compound 3 shown in "-izing 57" instead of an example of comparison 3 instantiation compound.

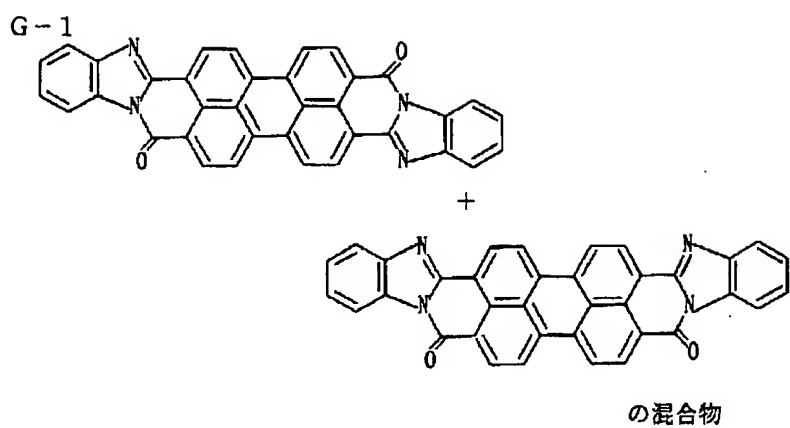
[0133] About the electrophotography photo conductor sample obtained by evaluation 3 examples 61-90 and the example 3 of comparison, picture \*\*\*\* was performed with the digital (Konica Corp. make) "copy Konica 9028" reconstruction machine (electrification polarity : positive, reversal development). Next, these samples were left for one month under low-temperature (10 degrees C) environment, and picture \*\*\*\* was again performed on the same conditions after that. The black spot point of the white portion of these copy pictures was evaluated. A result is shown in Tables 7-9.

[0134] In addition, evaluation of a black spot point measured the size and the number of a black spot point using image-analysis equipment "homme NIKON 300 type" (Shimadzu make), and was performed by judging how many black spot points per two with a diameter of 0.05mm or more there are 1cm. The criterion of black spot point evaluation is as being shown below. In addition, although it will be used if the results of a black spot point judging are O and O, it may not be suitable for practical use at \*\*, and when it is x, it is not suitable for practical use.

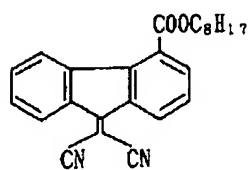
[0135]

The number of a black spot point with a diameter of 0.05mm or more (piece/cm<sup>2</sup>) Black spot point judging 0 O 1-3 O 4-10 \*\* 11 or more x [0136]

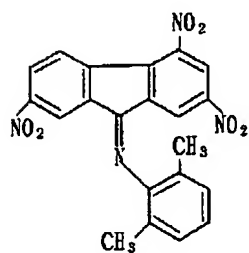
[Formula 57]



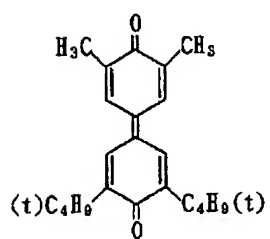
比較化合物 1



比較化合物 2



比較化合物 3



[0137]

[Table 1]

## A 1

実施例 No.	例示化合物 No.
1	A-1
2	A-3
3	A-4
4	A-7
5	A-15
6	A-19
7	A-20
8	A-27
9	A-28
10	A-30

## A 2

サンプル	感度( $\text{lux}\cdot\text{sec}$ ) +800V
実施例 1	2.0
2	2.4
3	3.1
4	2.5
5	3.2
6	2.7
7	2.5
8	2.2
9	2.8
10	2.5
比較例 1	7.3

[0138]

[Table 2]



## B 1

実施例 No.	例示化合物 No.
11	B-1
12	B-2
13	B-3
14	B-4
15	B-5
16	B-6
17	B-7
18	B-8
19	B-9
20	B-11

## B 2

サンプル	感度 ( $\text{lux} \cdot \text{sec}$ ) + 800 V
実施例 11	3.2
12	3.3
13	3.5
14	3.6
15	4.0
16	4.2
17	4.8
18	3.2
19	3.0
20	2.4
比較例 1	7.3

[0139]

[Table 3]

## C 1

実施例 No.	例示化合物 No.
21	C-1
22	C-2
23	C-3
24	C-4
25	C-5
26	C-6
27	C-7
28	C-8
29	C-9
30	C-10

## C 2

サンプル	感度 ( $\text{lux} \cdot \text{sec}$ ) +800V
実施例21	4.3
22	4.5
23	5.0
24	5.1
25	4.8
26	4.3
27	4.7
28	5.5
29	4.5
30	4.7
比較例 1	7.3

[0140]

[Table 4]

A 1

実施例 No.	例示化合物 No.
31	A-31
32	A-34
33	A-40
34	A-45
35	A-46
36	A-51
37	A-57
38	A-58
39	A-59
40	A-60

A 2

サンプル	初 期			10,000コピー後		
	V <sub>b</sub>	V <sub>w</sub>	V <sub>r</sub>	V <sub>b</sub>	V <sub>w</sub>	V <sub>r</sub>
実施例31	880	140	20	865	145	25
32	855	160	25	850	160	35
33	890	155	35	870	160	40
34	860	160	25	850	170	40
35	870	145	30	835	160	50
36	860	140	40	860	155	60
37	880	150	30	820	165	50
38	840	135	20	815	150	45
39	835	125	25	815	145	40
40	860	150	20	845	155	45
比較例 2	730	125	40	725	250	100

[0141]

[Table 5]

## B 1

実施例 No.	例示化合物 No.
41	B-10
42	B-12
43	B-13
44	B-14
45	B-15
46	B-16
47	B-17
48	B-18
49	B-19
50	B-20

## B 2

サンプル	初 期			10,000コピー後		
	V <sub>b</sub>	V <sub>w</sub>	V <sub>r</sub>	V <sub>b</sub>	V <sub>w</sub>	V <sub>r</sub>
実施例41	720	110	20	705	125	50
42	725	120	30	710	130	40
43	730	130	35	720	135	45
44	742	110	25	725	115	45
45	720	130	35	740	145	39
46	730	125	40	720	130	50
47	735	115	35	730	130	45
48	725	120	30	725	140	45
49	740	125	25	720	130	35
50	735	135	35	715	145	30
比較例 2	730	125	40	725	250	100

[0142]

[Table 6]

## C 1

実施例 No.	例示化合物 No.
51	C-11
52	C-12
53	C-13
54	C-14
55	C-15
56	C-16
57	C-17
58	C-18
59	C-19
60	C-20

## C 2

サンプル	初 期			10,000コピー後		
	V <sub>b</sub>	V <sub>w</sub>	V <sub>r</sub>	V <sub>b</sub>	V <sub>w</sub>	V <sub>r</sub>
実施例51	710	120	20	705	115	35
52	725	130	25	700	120	50
53	740	135	25	725	115	45
54	730	125	30	715	110	45
55	725	115	40	720	105	60
56	735	118	25	710	110	40
57	715	125	35	698	100	55
58	710	120	25	700	115	45
59	735	135	30	715	115	50
60	725	125	20	705	110	40
比較例 2	730	125	40	725	250	100

[0143]

[Table 7]

## A 1

実施例 No.	例示化合物 No.
61	A-62
62	A-64
63	A-65
64	A-70
65	A-71
66	A-74
67	A-82
68	A-83
69	A-89
70	A-90

## A 2

サンプル	初 期	10℃放置後
61	◎	◎
62	◎	○
63	◎	○
64	◎	○
65	◎	○
66	◎	○
67	◎	○
68	◎	△
69	◎	○
70	◎	○
比較例 3	△	×

[0144]

[Table 8]

## B 1

実施例 No.	例示化合物 No.
71	B-21
72	B-22
73	B-23
74	B-24
75	B-25
76	B-26
77	B-27
78	B-28
79	B-29
80	B-30

## B 2

サンプル	初 期	10℃放置後
71	◎	◎
72	◎	◎
73	◎	◎
74	◎	○
75	◎	○
76	◎	○
77	◎	△
78	◎	○
79	◎	○
80	◎	◎
比較例 3	△	×

[0145]

[Table 9]

## C 1

実施例 No.	例示化合物 No.
81	C-1
82	C-5
83	C-10
84	C-16
85	C-21
86	C-24
87	C-21
88	C-26
89	C-27
90	C-30

## C 2

サンプル	初 期	10℃放置後
81	◎	◎
82	◎	◎
83	◎	○
84	◎	○
85	◎	○
86	◎	◎
87	◎	◎
88	◎	◎
89	◎	○
90	◎	○
比較例 3	△	×

[0146] As mentioned above, as compared with the charge photograph photo conductor using the conventional charge transportation matter, the electrophotography photo conductor using the electronic transportation matter of this invention has high sensitivity, and its photo conductor property at the time of recurrence use is also stable, and after a cold storage understands it that there is very little generating of a picture defect so that clearly from each \*\*.

[0147]

[Effect of the Invention] The compound of this invention has electronic transportation ability, and can offer the laminating type photo conductor for right electrification with high sensitivity, a low rest potential, and good quality-of-image maintenance nature.

[Translation done.]



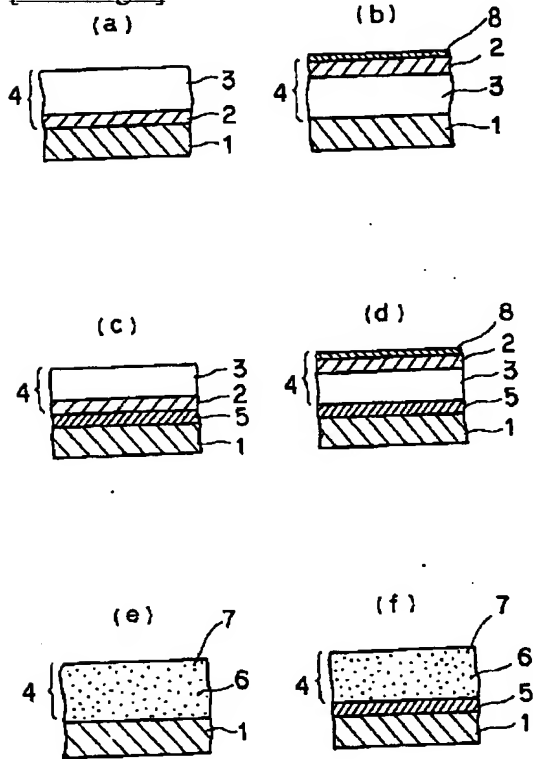
## \* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DRAWINGS

[Drawing 1]



[Translation done.]

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(71) 出願人 000001270

コニカ株式会社

東京都新宿区西新宿1丁目26番2号

(72) 発明者 裴 元虎

東京都日野市さくら町1番地コニカ株式会社内

(72) 発明者 藤本 信吾

東京都日野市さくら町1番地コニカ株式会社内

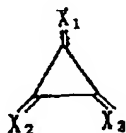
(54) 【発明の名称】 電子写真感光体

(57) 【要約】 (修正有)

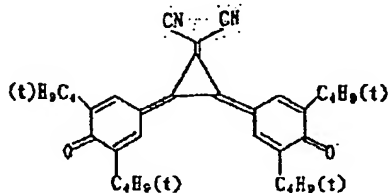
【目的】 (1) 電子輸送能を有する電荷輸送物質を用いた電子写真感光体を提供し、(2) 優れた電子写真性能を有する正帯電用積層型電子写真感光体を提供する。

【構成】 下記一般式【A】【B】【C】のいずれかを含む感光体。

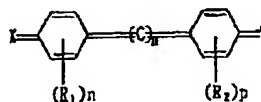
一般式【A】



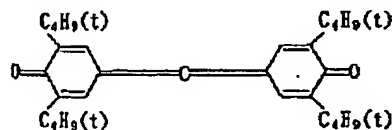
例えば



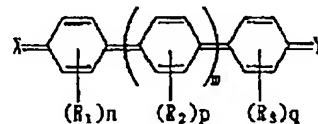
一般式【B】



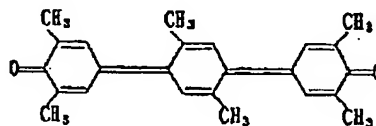
例えば



一般式【C】

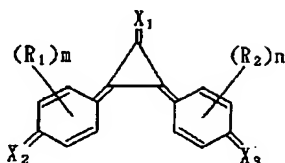


例えば

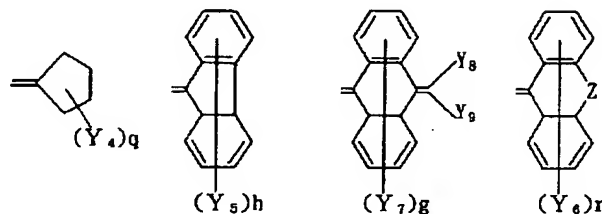


【請求項１】 導電性支持体上に感光層を設けた電子写真感光体において、前記感光層中に下記一般式〔Ａ〕で表される化合物を含有する電子写真感光体。

一般式 [A]



式中、 $X_1$ ,  $X_2$ 又は $X_3$ は酸素原子、 $=N-CN$ ,  $\begin{array}{c} Y_1 \\ \diagdown \\ C \\ \diagup \\ Y_2 \end{array}$ ,  $\begin{array}{c} \text{(---)} \\ | \\ \text{(Y}_3\text{)}_k \end{array}$



Qは酸素原子、 $=C \begin{matrix} Y_{10} \\ Y_{11} \end{matrix}$  ,  $=N-CN$

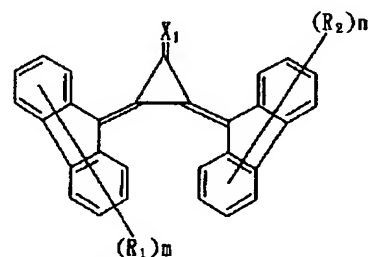
R<sub>1</sub>、R<sub>2</sub>は置換基を有してもよいアルキル基、置換基を有してもよいビニル基、置換基を有してもよいエステル基、置換基を有してもよいアシル基、置換基を有してもよいアミド基、また、水素原子、シアノ基、ニトロ基を表す。m、nは0～3の整数を表す。k、g、h、p、q、rは、0～3の整数を表す。Y<sub>1</sub>～Y<sub>9</sub>は、水素原子、シアノ基、ニトロ基、ハロゲン基、又は置換してもよいエステル基、置換してもよいアシル基、置換してもよいアミド基、置換してもよいビニル基、置換してもよいフェニル基を表す。Zは酸素原子、硫黄原子、=C=Oを表す。さらにY<sub>10</sub>、Y<sub>11</sub>は水素原子、ハロゲン原子、シアノ基、ニトロ基、又は置換してもよいエステル基、置換してもよいアシル基、置換してもよいアミド基、置換してもよいビニル基、置換してもよいフェニル基を表す。

【化 3】

X<sub>1</sub>、X<sub>2</sub>又はX<sub>3</sub>は置換基を有してもよい有機残基であつて、X<sub>1</sub>、X<sub>2</sub>又はX<sub>3</sub>は互いに異なつてもよい。

【請求項2】 前記一般式〔A〕の表す化合物が下記一般式〔a<sub>1</sub>〕,〔a<sub>2</sub>〕,〔a<sub>3</sub>〕で表される化合物であることを特徴とする請求項1に記載の電子写真感光体。

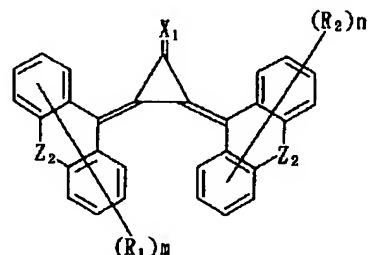
【化2】



式中、 $X_1$ ,  $R_1$ ,  $R_2$ は一般式〔a1〕と同一。

【化4】

一般式  $[a, b]$



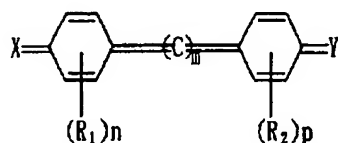
式中、 $X_1$ 、 $R_1$ 、 $R_2$ は一般式〔a1〕と同一。ただし、 $Z_2$ は酸素原子、硫黄原子、 $=C=O$ 、 $=C=C(Y_{12})$  ( $Y_{13}$ )。  $Y_{12}$ 、 $Y_{13}$ は水素原子、シアノ基、ニトロ基、ハロゲン基、又は置換してもよいエステル基、置換して

もよいアシル基、置換してもよいアミド基、置換してもよいビニル基、置換してもよいフェニル基を表す。

【請求項3】 導電性支持体上に感光層を設けた電子写真感光体において、前記感光層に下記一般式〔B〕で表される化合物を含有する電子写真感光体。

【化5】

一般式〔B〕

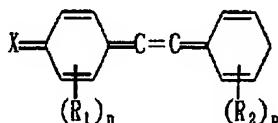


一般式〔B〕において、X、Yは=O、=C(Z)(W)、=N-CNであり、更に、Z、Wは水素原子、ハロゲン原子又は-CN、R<sub>3</sub>置換フェニル基（R<sub>3</sub>はアルキル、アシル、エステル、メトキシ、-CF<sub>3</sub>、-CN、-NO<sub>2</sub>の各基又は水素原子）、エステル基である。R<sub>1</sub>、R<sub>2</sub>はアルキル、アルコキシ、アシル、エステル、フェニル、アミド、スルホンアミドの各基である。またmは1～4の整数を表す。n $\geq$ 0、p $\geq$ 0但しn、pのいずれかが2以上の時にはR<sub>1</sub>及びR<sub>2</sub>は互いに異なってもよい。

【請求項4】 前記一般式〔B〕の表す化合物が下記一般式〔b〕で表される化合物であることを特徴とする請求項3に記載の電子写真感光体。

【化6】

一般式〔b〕

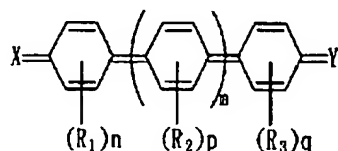


一般式〔b〕において、Xは=O、=C(Z)(W)、=N-CNであり、更に、Z、Wは水素原子、ハロゲン原子又は-CN、R<sub>3</sub>置換フェニル基（R<sub>3</sub>はアルキル、アシル、エステル、メトキシ、-CF<sub>3</sub>、-CN、-NO<sub>2</sub>の各基又は水素原子）、エステル基である。R<sub>1</sub>、R<sub>2</sub>はアルキル、アルコキシ、アシル、エステル、フェニル、アミド、スルホンアミドの各基である。n $\geq$ 0、p $\geq$ 0但し、n、pのいずれかが2以上の時にはR<sub>1</sub>及びR<sub>2</sub>は互いに異なってもよい。

【請求項5】 導電性支持体上に感光層を設けた電子写真感光体において、前記感光層に下記一般式〔C〕で表される化合物を含有する電子写真感光体。

【化7】

一般式〔C〕



一般式〔C〕において、X、Yは=O、=C(Z)(W)、

=N-CNであり、更に、Z、Wは水素原子、ハロゲン原子又は-CN、R<sub>4</sub>置換フェニル基（R<sub>4</sub>はアルキル、アシル、エステル、メトキシ、-CF<sub>3</sub>、-CN、-NO<sub>2</sub>の各基又は水素原子）エステル基である。R<sub>1</sub>、R<sub>2</sub>又はR<sub>3</sub>はアルキル、アルコキシ、アシル、エステル、フェニル、アミド、スルホンアミドの各基である。またmは1～2の整数を表す。m=1の時はp $\geq$ 1。m=2の時はp $\geq$ 0。q $\geq$ 0、n $\geq$ 0但しq、nのいずれかが2以上の時にはR<sub>1</sub>、R<sub>2</sub>及びR<sub>3</sub>は互いに異なってもよい。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、静電潜像を形成させるための電子写真感光体に関する。更に詳述すると、電子輸送能を有する化合物を含有する層を有する電子写真感光体に関する。

【0002】

【従来技術】 従来、有機光導電体を用いた電子写真感光体は、無公害、高生産性、低コスト等の利点があるため種々研究されてきており、実際に、中低速用複写機の感光体として実用に供されている。これら電子写真感光体には、積層タイプと単層タイプのものがあるが、有機光導電体を用いた感光体は一般に光照射により電荷を発生する電荷発生層と、生じた電荷を輸送する電荷輸送層からなる積層構造を採っている。この場合、電荷輸送層に用いられる電荷輸送物質としてはポリ-N-ビニルカルバゾールのような高分子材料や、ピラゾリン、ヒドラゾン、トリフェニルアミン誘導体のような低分子化合物が用いられる。

【0003】 しかしながら、これらの電荷輸送物質はいずれも正孔輸送能を有するため、感光体の表面を負に帯電させる現象方式が採られているのがほとんどである。このため、従来高速機で用いられてきたトナーが利用できず、高画質のものが少ないのが現状である。更にこのように感光体表面を負に帯電させる場合、帯電時に空気中の酸素との反応によりオゾンが発生し環境を害するばかりか感光体表面を劣化させるという問題がある。

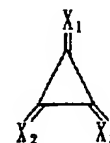
【0004】 又、一方では積層感光体の感光層の層構成を逆にして、電子輸送層を下側に、電子発生層を上側に設けた正帯電用積層感光体が開発されているが、帯電電位が低く、耐刷性が劣っているため、電子発生層の上に更に保護層を設けるといった構成になっている。

【0005】

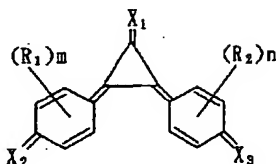
【発明が解決しようとする課題】 上記のような問題を解決するためには、電子輸送能を有する電荷輸送物質を電荷輸送層に用い、更に感光体表面を正に帯電するようにした感光体を構成すればよい。このような電子輸送性素材としては2,4,7-トリニトロ-9-フルオレノンが知られているが、溶解性が悪く、既存の電荷発生物質と組合せて実用的な感度を出すことはできなかった。更に、2,4,7-トリニトロ-9-フルオレノンの改良研究の結果とし

(1) 導電性支持体上に感光層を設けた電子写真感光体  
一般式 {a<sub>1</sub>}

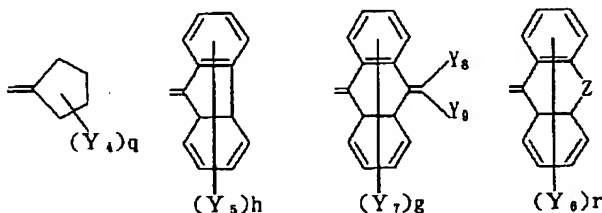
### 一般式〔A〕



【化9】



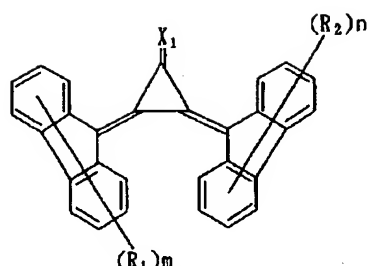
式中、 $X_1$ ,  $X_2$ 又は $X_3$ は酸素原子、 $=N-CN$ ,  $=C \begin{matrix} Y_1 \\ Y_2 \end{matrix}$ ,  $\text{---}(\text{---}\text{C}_6\text{H}_4\text{---})_k\text{---}$



Qは酸素原子、 $=C \begin{matrix} \nearrow Y_{10} \\ \searrow Y_{11} \end{matrix}$  ,  $=N-CN$

【0017】Zは酸素原子、硫黄原子、 $=C=O$ を表

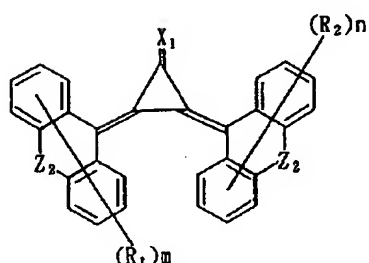
【化 1 0】

一般式〔a<sub>2</sub>〕

【0020】式中、X<sub>1</sub>、R<sub>1</sub>、R<sub>2</sub>は一般式〔a<sub>1</sub>〕と同一。

【0021】

【化11】

一般式〔a<sub>3</sub>〕

【0022】式中、X<sub>1</sub>、R<sub>1</sub>、R<sub>2</sub>は一般式〔a<sub>1</sub>〕と同一。

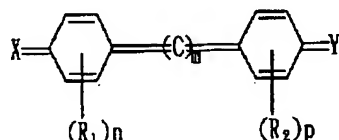
【0023】ただし、Z<sub>2</sub>は酸素原子、硫黄原子、=C=O、=C=C(Y<sub>12</sub>)(Y<sub>13</sub>)。Y<sub>12</sub>、Y<sub>13</sub>は水素原子、シアノ基、ニトロ基、ハロゲン基、又は置換してもよいエステル基、置換してもよいアシル基、置換してもよいアミド基、置換してもよいビニル基、置換してもよいフェニル基を表す。

【0024】(3)導電性支持体上に感光層を設けた電子写真感光体において、前記感光層に下記一般式〔B〕で表される化合物を含有する電子写真感光体。

【0025】

【化12】

一般式〔B〕



【0026】一般式〔B〕において、X、Yは=O、=C(Z)(W)、=N-CNであり、更に、Z、Wは水素原子、ハロゲン原子又は-CN、R<sub>3</sub>置換フェニル基（R<sub>3</sub>はアルキル、アシル、エステル、メトキシ、-CF<sub>3</sub>、-CN、-NO<sub>2</sub>の各基又は水素原子）、エステル基である。

【0027】R<sub>1</sub>、R<sub>2</sub>はアルキル、アルコキシ、アシル、エステル、フェニル、アミド、スルホンアミドの各基である。またmは1~4の整数を表す。

【0028】n≥0、p≥0但しn、pのいずれかが2以上の時にはR<sub>1</sub>及びR<sub>2</sub>は互いに異なってもよい。

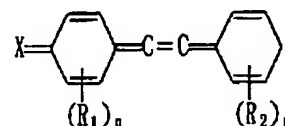
【0029】(4)前記一般式〔B〕の表す化合物が下

記一般式〔b〕で表される化合物であることを特徴とする(3)の電子写真感光体。

【0030】

【化13】

一般式〔b〕



【0031】一般式〔b〕において、Xは=O、=C(Z)(W)、=N-CNであり、更に、Z、Wは水素原子、ハロゲン原子又は-CN、R<sub>3</sub>置換フェニル基（R<sub>3</sub>はアルキル、アシル、エステル、メトキシ、-CF<sub>3</sub>、-CN、-NO<sub>2</sub>の各基又は水素原子）、エステル基である。

【0032】R<sub>1</sub>、R<sub>2</sub>はアルキル、アルコキシ、アシル、エステル、フェニル、アミド、スルホンアミドの各基である。

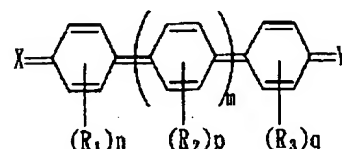
【0033】n≥0、p≥0但し、n、pのいずれかが2以上の時にはR<sub>1</sub>及びR<sub>2</sub>は互いに異なってもよい。

【0034】(5)導電性支持体上に感光層を設けた電子写真感光体において、前記感光層に下記一般式〔C〕で表される化合物を含有する電子写真感光体。

【0035】

【化14】

一般式〔C〕



【0036】一般式〔C〕において、X、Yは=O、=C(Z)(W)、=N-CNであり、更に、Z、Wは水素原子、ハロゲン原子又は-CN、R<sub>4</sub>置換フェニル基（R<sub>4</sub>はアルキル、アシル、エステル、メトキシ、-CF<sub>3</sub>、-CN、-NO<sub>2</sub>の各基又は水素原子）エステル基である。

【0037】R<sub>1</sub>、R<sub>2</sub>又はR<sub>3</sub>はアルキル、アルコキシ、アシル、エステル、フェニル、アミド、スルホンアミドの各基である。またmは1~2の整数を表す。m=1の時はp≥1。m=2の時はp≥0。

【0038】q≥0、n≥0但し、q、nのいずれかが2以上の時にはR<sub>1</sub>、R<sub>2</sub>及びR<sub>3</sub>は互いに異なってもよい。

【0039】本発明の電子輸送物質としての高性能は、従来の電子輸送物質に比べ、バインダとの長期間の相溶性が安定に保たれるようになったことに由来すると思われる。

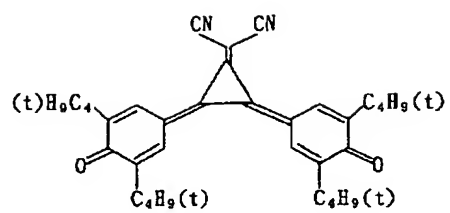
【0040】次に前記一般式で表される化合物の具体例及びその合成例を示す。

【0041】(A)一般式〔A〕で表される化合物：例示化合物：

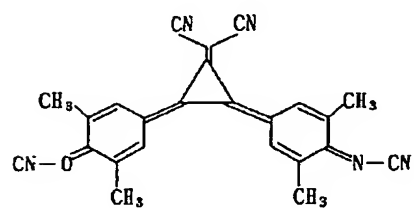
【0042】

【化15】

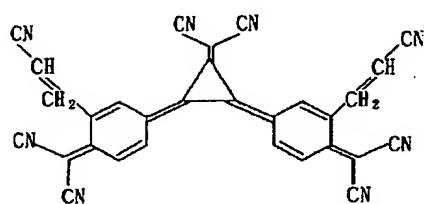
A-1



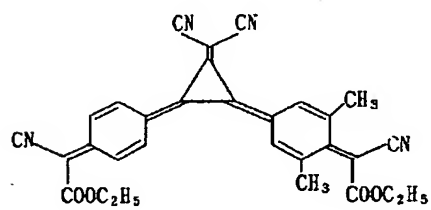
A-2



A-3



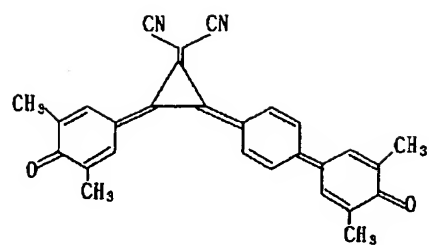
A-4



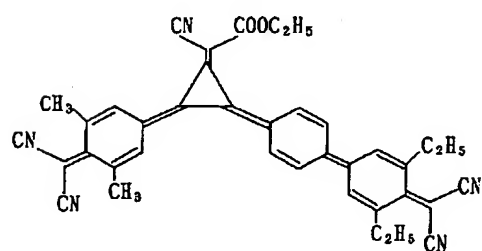
【0043】

【化16】

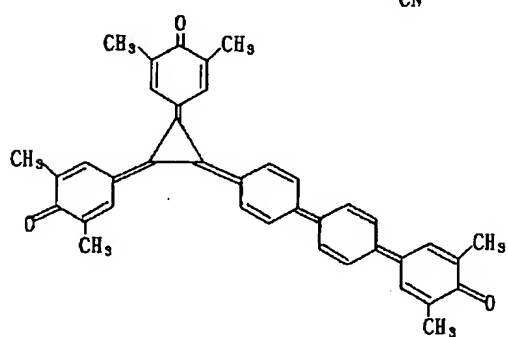
A-5



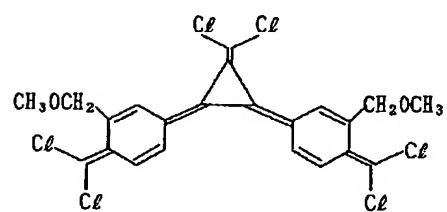
A-6



A-7



A-8

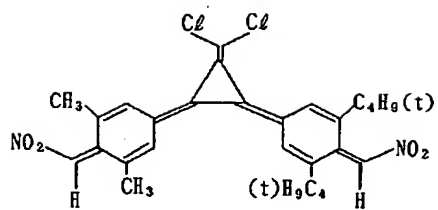


【0044】

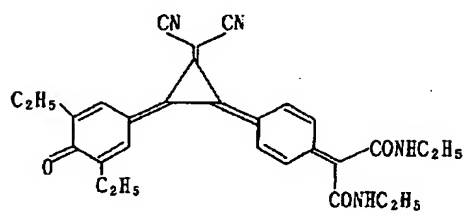
【化17】



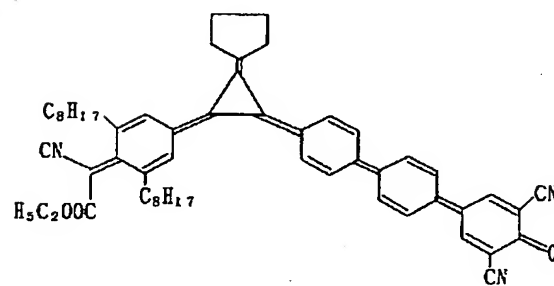
A-9



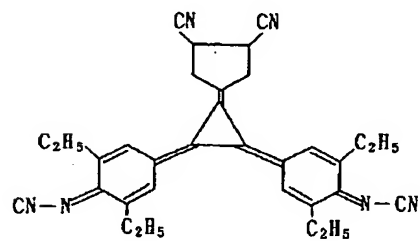
A-10



A-11



A-12



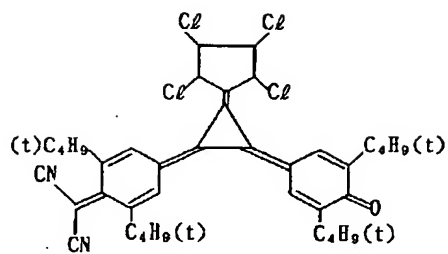
【0045】

【化18】

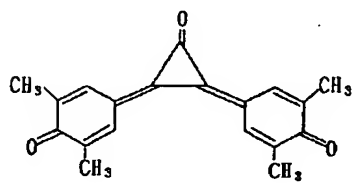
A-13

[0046]

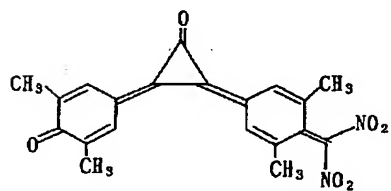
[化19]



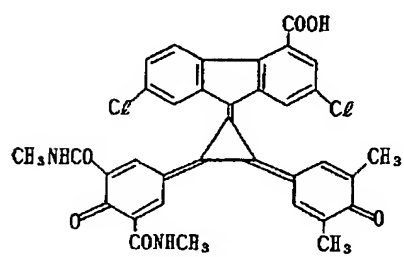
A-14



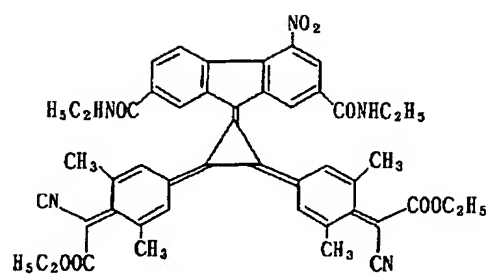
A-15



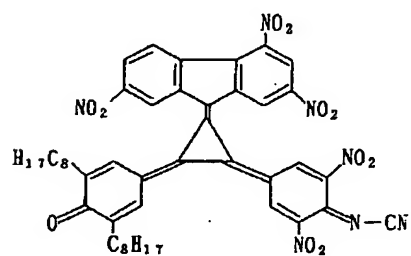
A-16



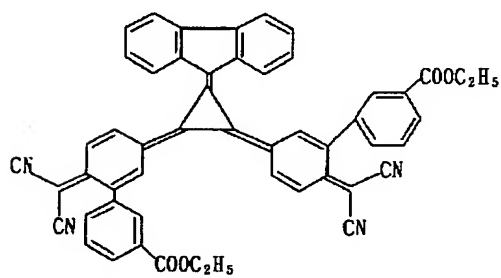
A-17



A-18



A-19

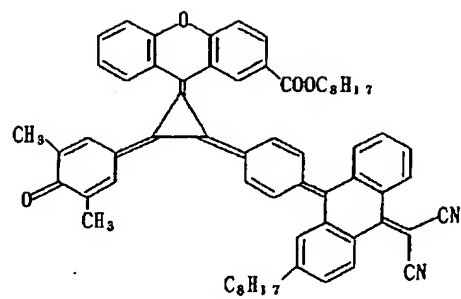


【 0 0 4 7 】  
【 化 2 0 】

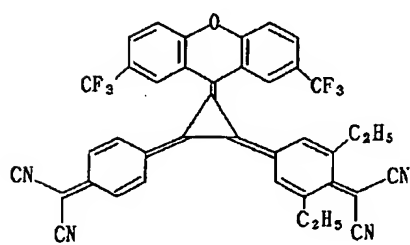
A-20

[0048]

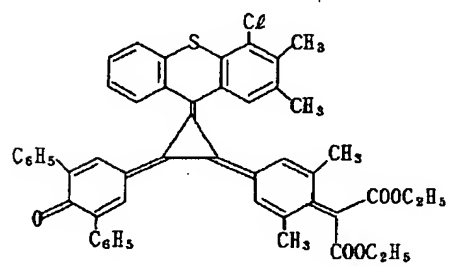
[化21]



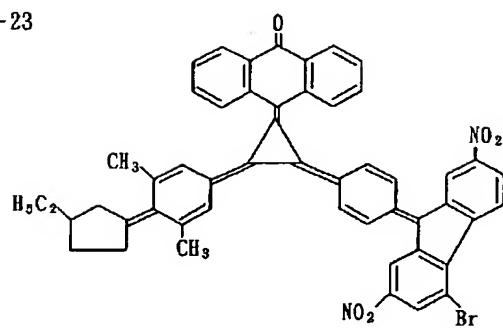
A-21



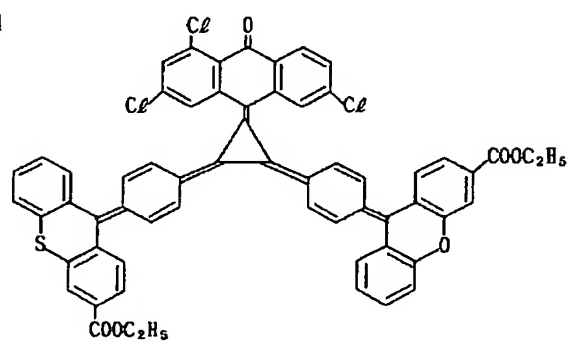
A-22



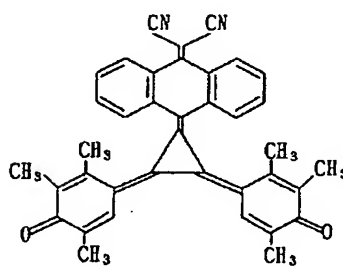
A-23



A-24

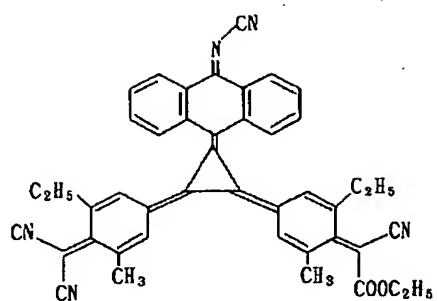


A-25

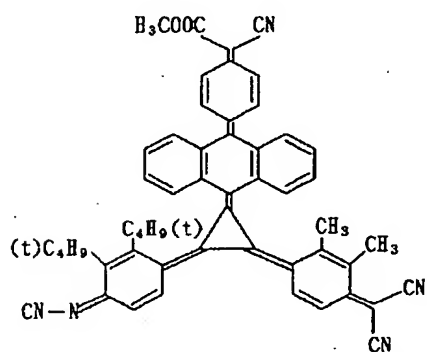


[0049]  
[化22]

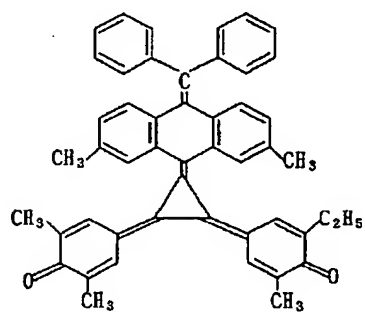
A-26



A-27

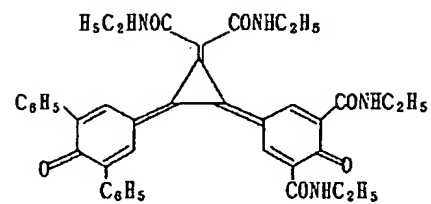


A-28

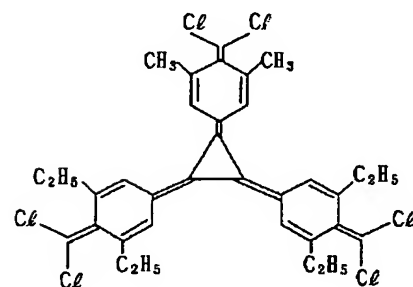


[0050]  
[化23]

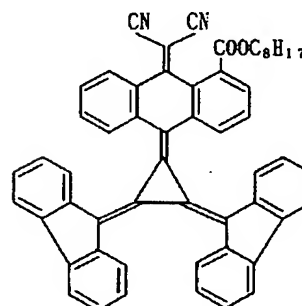
A-29



A-30

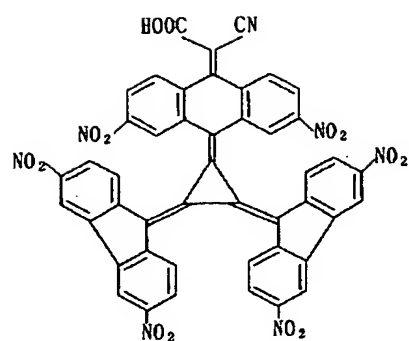


A-31

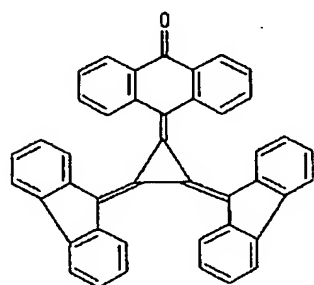


[0051]  
[化24]

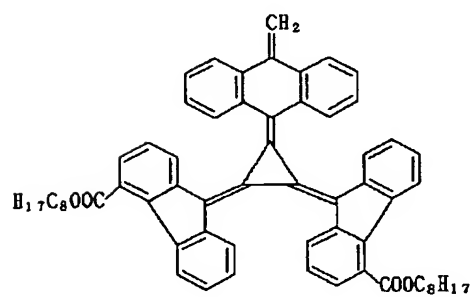
A-32



A-33

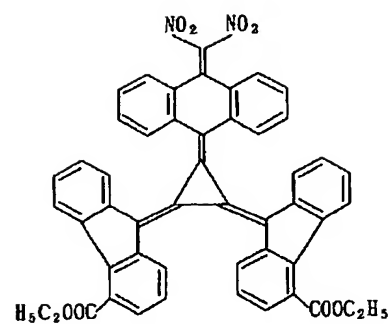


A-34

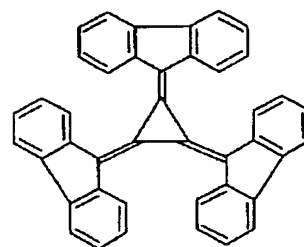


【0052】  
【化25】

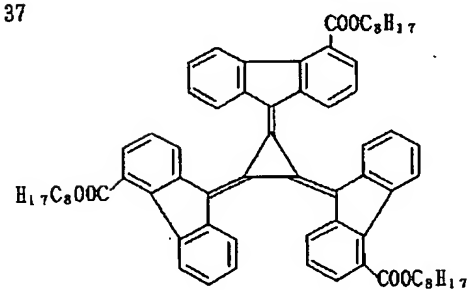
A-35



A-36

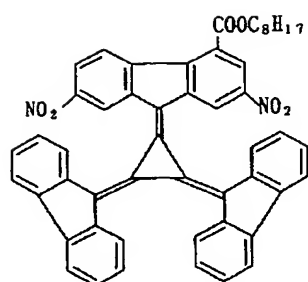


A-37

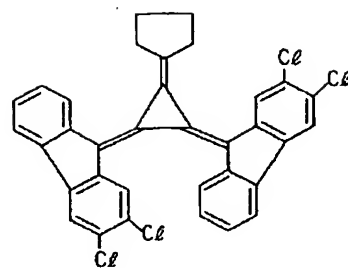


【0053】  
【化26】

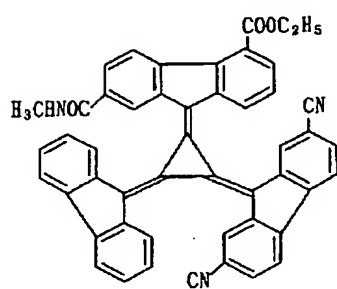
A-38



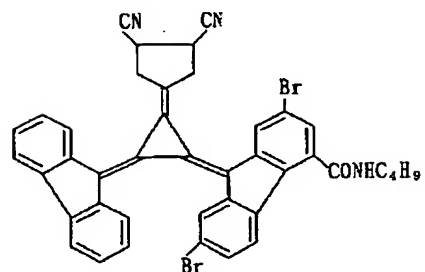
A-41



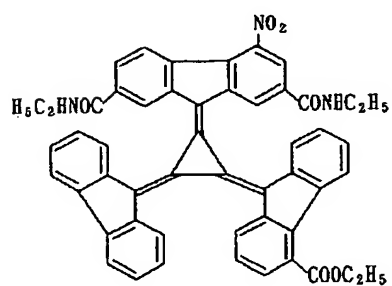
A-39



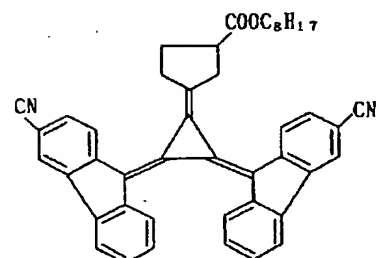
A-42



A-40



A-43

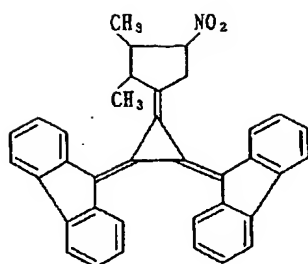


【0054】  
【化27】

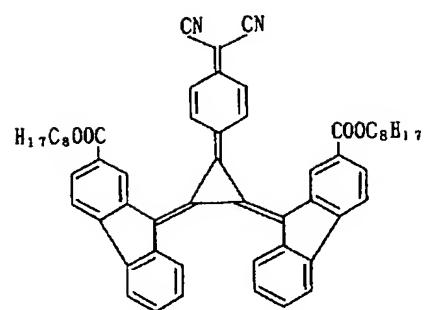
【0055】  
【化28】



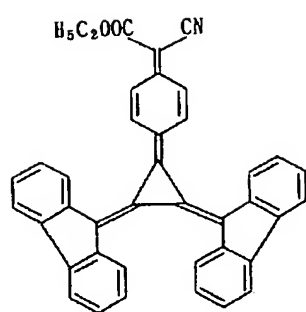
A-44



A-47



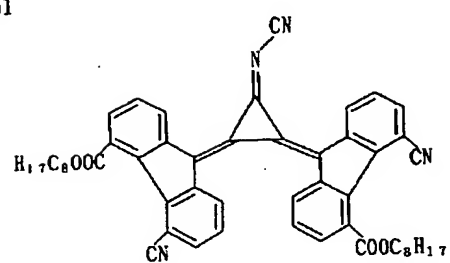
A-50



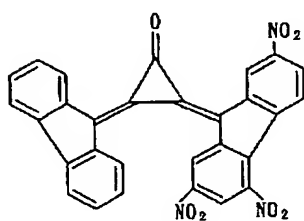
【0058】

【化31】

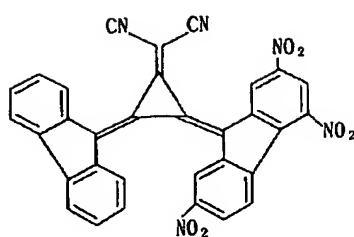
A-51



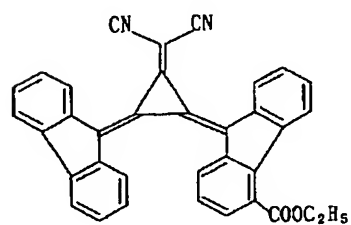
A-52



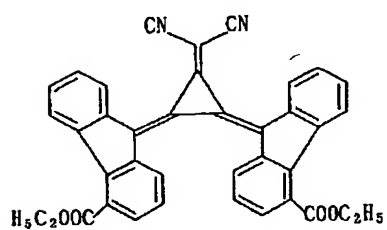
A-53



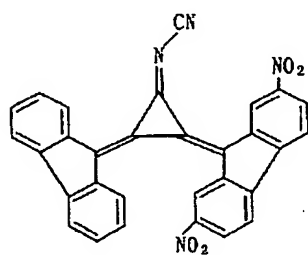
A-54



A-55

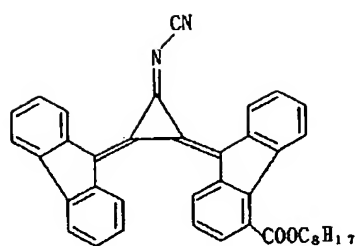


A-56

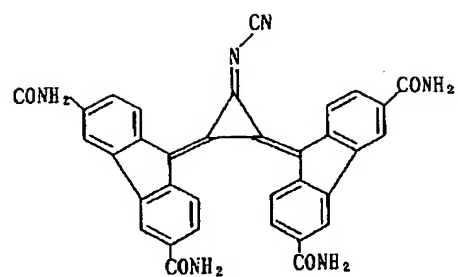


【0059】  
【化32】

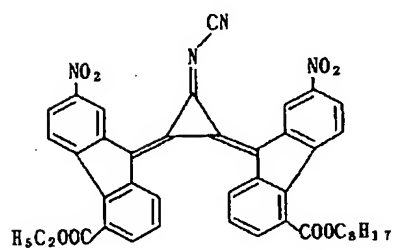
A-57



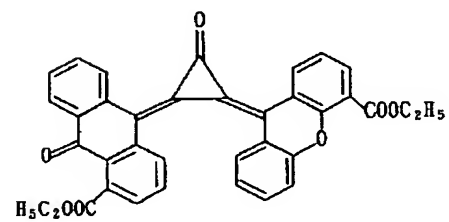
A-60



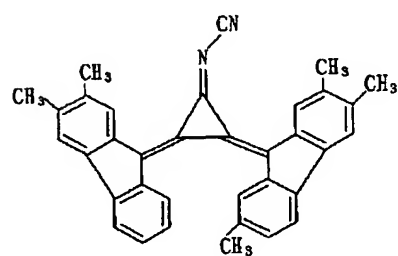
A-58



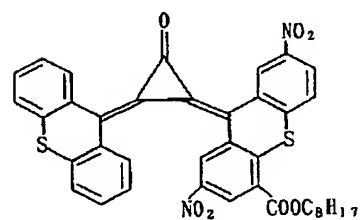
A-61



A-59



A-62



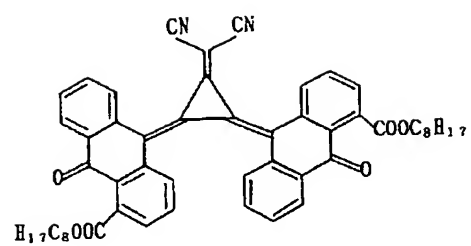
[0060]

[化33]

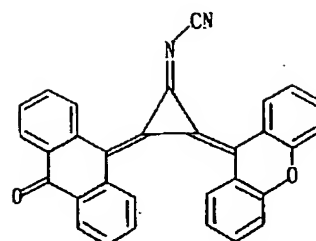
[0061]

[化34]

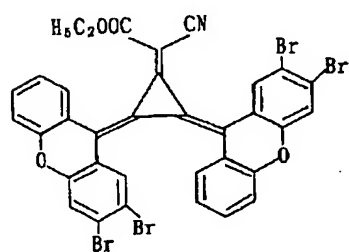
A-63



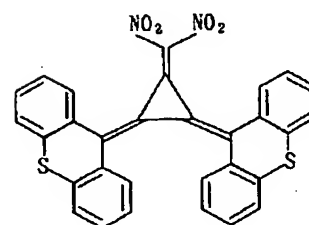
A-66



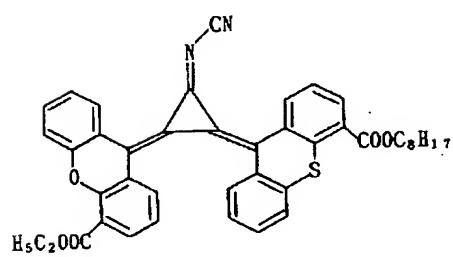
A-64



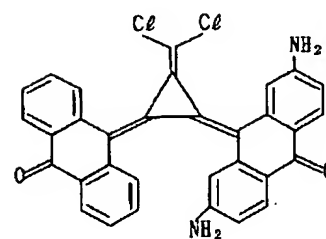
A-67



A-65



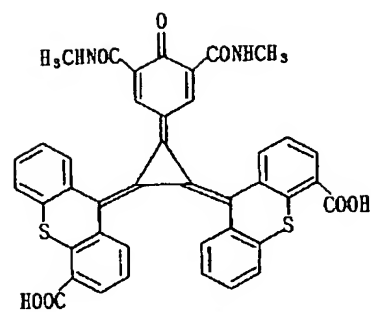
A-68



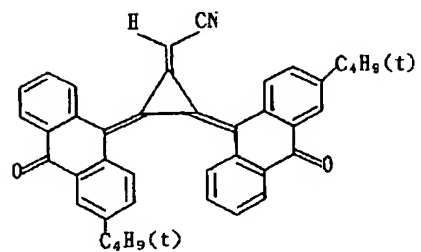
[0062]  
[化35]

[0063]  
[化36]

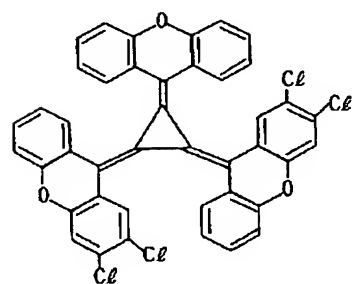
A-72



A-73

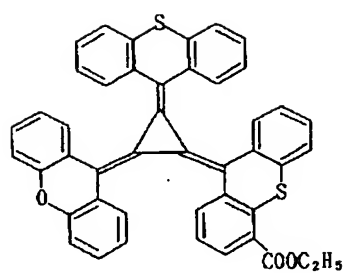


A-74

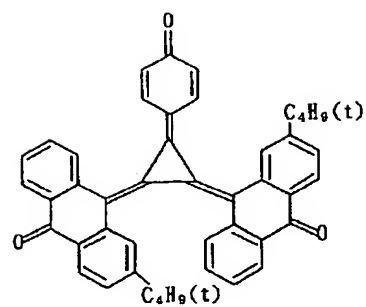


【0 0 6 5】  
【化 3 8】

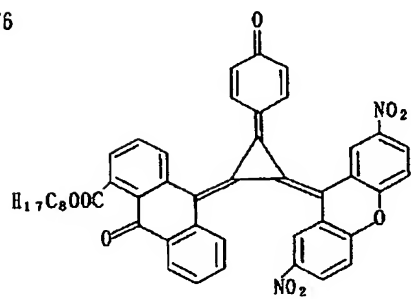
A-75



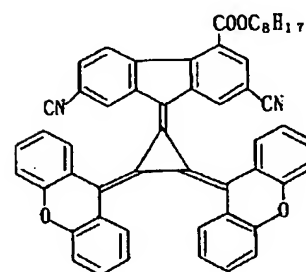
A-78



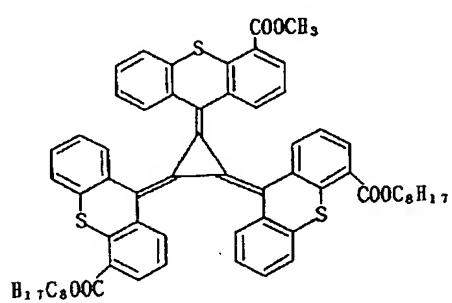
A-76



A-79

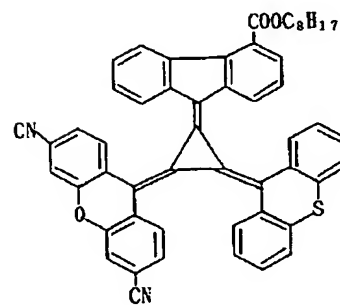


A-77



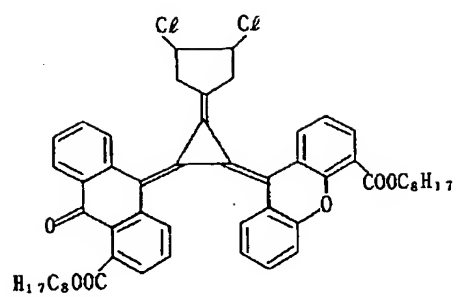
[0066]  
[化39]

A-80

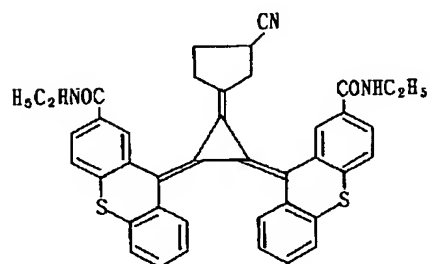


[0067]  
[化40]

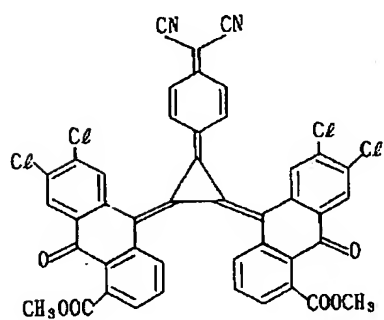
A-81



A-82

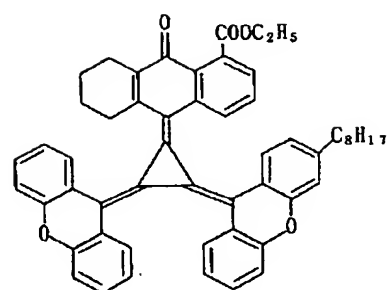


A-83

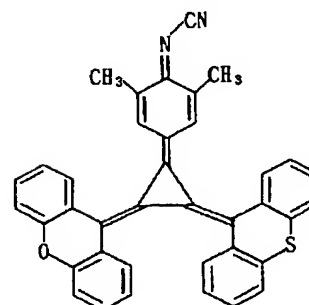


[0068]  
[化41]

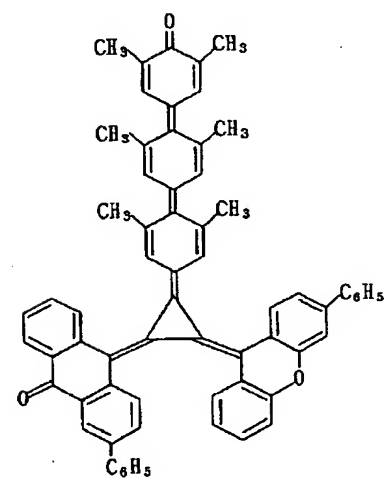
A-84



A-85



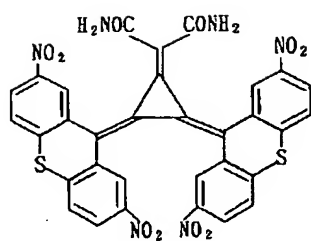
A-86



[0069]  
[化42]



A-87

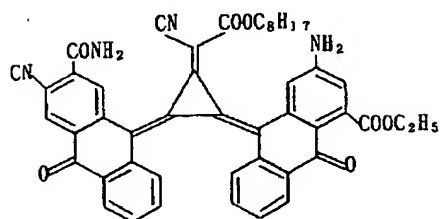


【0070】：合成例：

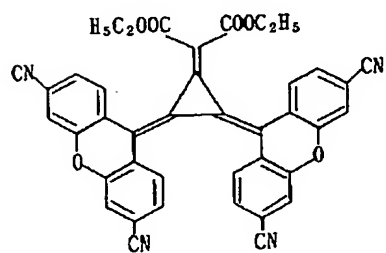
【0071】

【化43】

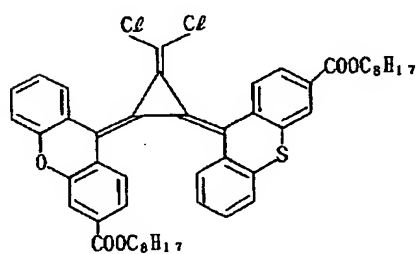
A-88

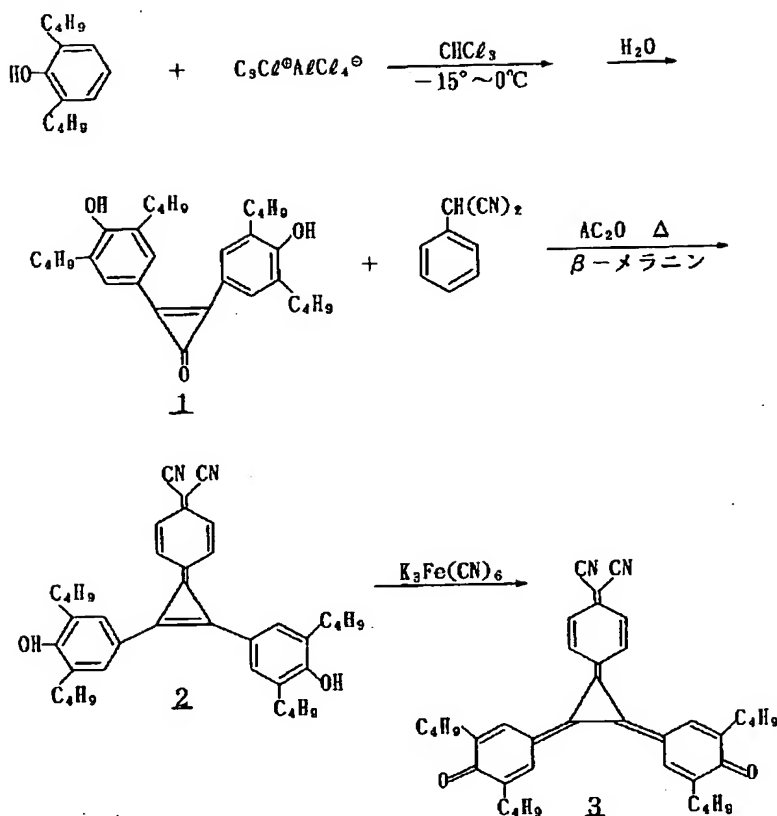


A-89



A-90





## 例示化合物 A-1

【0072】上記のスキームに従い、例示化合物 A-1 を合成した。すなわち、塩化アルミニウム 10 g (0.075 mol) とテトラクロロシクロプロペン 13.4 g (0.075 mol) と塩化メチレン 10 ml を 300 ml の四頭フラスコに入れ、窒素気流下、reflux まで加熱して、2 時間撹拌した。

【0073】その後、その反応液を  $-15^\circ C$  まで冷却し、塩化メチレン 10 ml を追加して、さらに、75 ml 塩化メチレンに溶かした 2,6-tert-ブチルフェノール 30.9 g (0.15 mol) を加えた。反応温度は  $-10^\circ C \sim 5^\circ C$  間を保持し、1 時間撹拌した。

【0074】その後、純水 100 ml を加え、有機層を分離し、塩化メチレン層を  $Na_2SO_4$  で乾燥し、塩化メチレンを減圧留去し、1 の粗結晶を得た。これをエチルエーテル 100 ml で再結晶し、1 を白色結晶にて 22.2 g (Y64%) 得た。

【0075】次に、1 1.34 g (2.9 mmol) とフェニルマロノニトリル 0.75 g (5.3 mmol) と  $\beta$ -アラニン 0.01 g と無水酢酸 3.5 ml を 50 ml の四頭フラスコに入れ、reflux 温度で 15 分撹拌する。

【0076】その後、反応を冷却し、オレンジ色の粗結晶を得た。この粗結晶をクロロベンゼンに再結晶し、2 をオレンジ色の結晶にて 1.27 g (Y74.7%) 得た。

【0077】その後、その有機層を分離し、さらに有機層を水洗しベンゼン層を  $MgSO_4$  で乾燥し、ベンゼンを減圧留去し、blue-purple 色の結晶として、例示化合物 B-10.62 g を収率 91% で得た。融点は  $270^\circ C$ 。

【0078】元素分析値が計算値と一致することから例示化合物 A-1 の構造を確認した。

【0079】

## 元素分析データ

	C	H	N
測定値	84.05 (%)	7.11	4.11
計算値	84.16	7.07	4.09

(B) 一般式 [B] で表される化合物

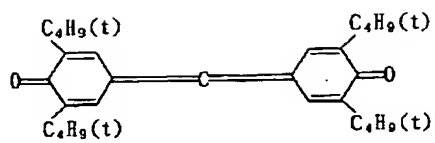
: 例示化合物:

【0080】

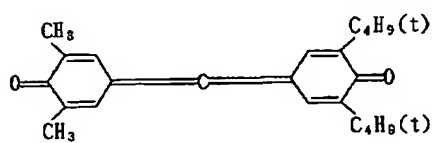
【化 4 4】

## 例示化合物 B

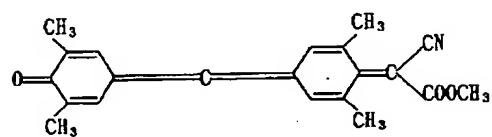
B - 1



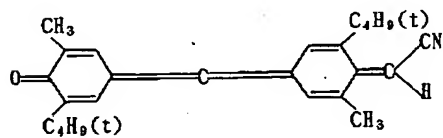
B - 2



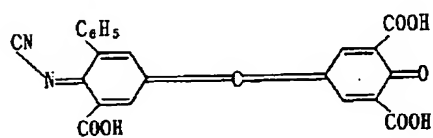
B - 3



B - 4



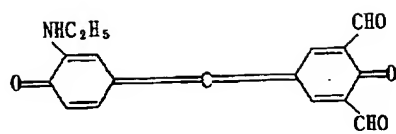
B - 5



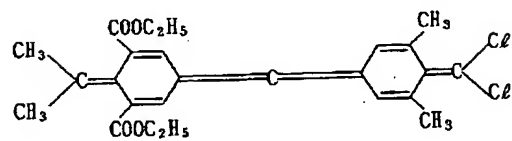
【0081】

【化45】

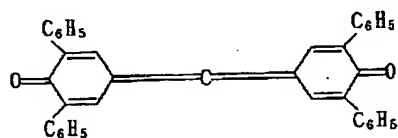
B-6



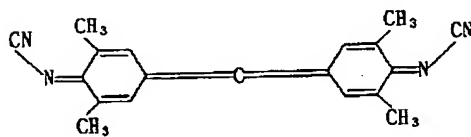
B-7



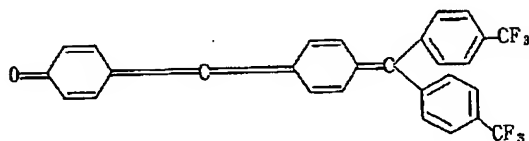
B-8



B-9



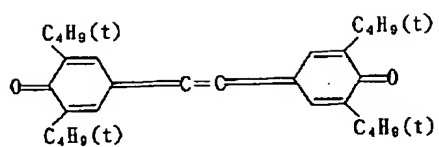
B-10



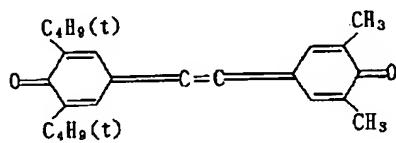
【0082】

【化46】

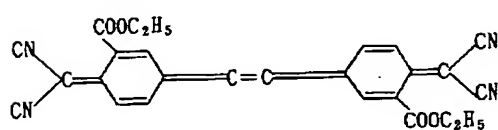
B-11



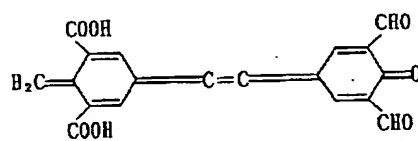
B-12



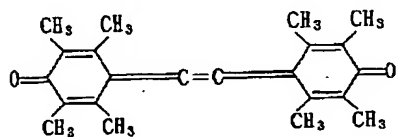
B-13



B-14



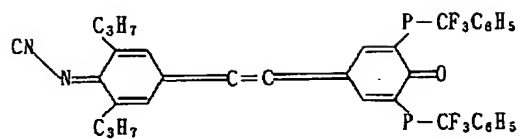
B-15



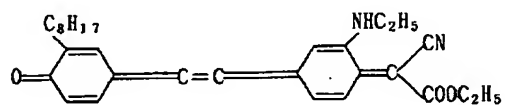
【0083】

【化47】

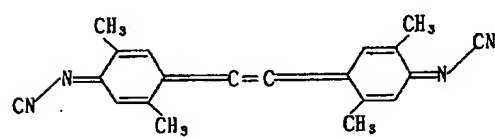
B-16



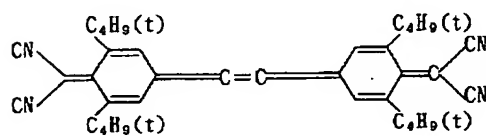
B-17



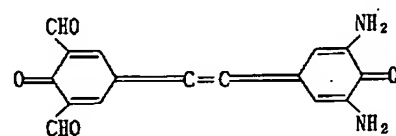
B-18



B-19



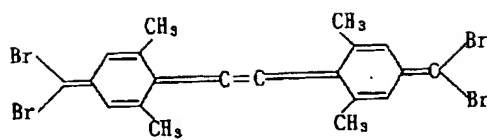
B-20



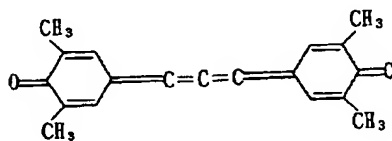
【0084】

【化48】

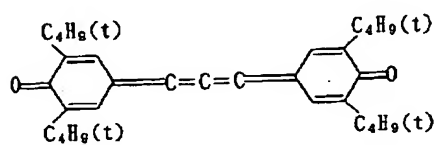
B-21



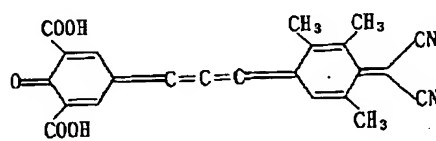
B-22



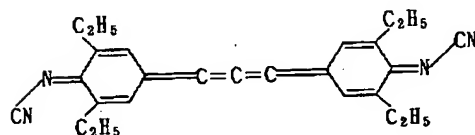
B-23



B-24



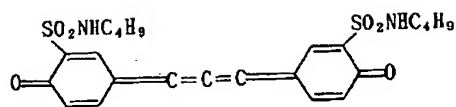
B-25



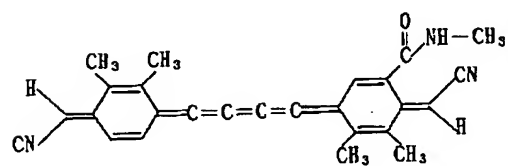
【0085】

【化49】

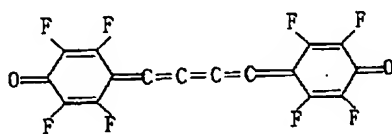
B-26



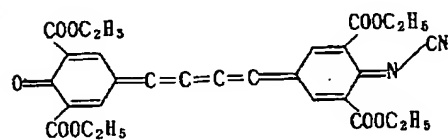
B-27



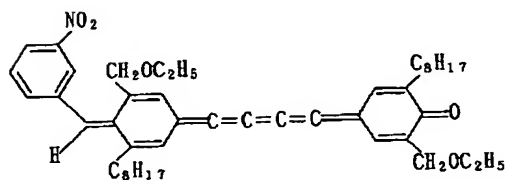
B-28



B-29



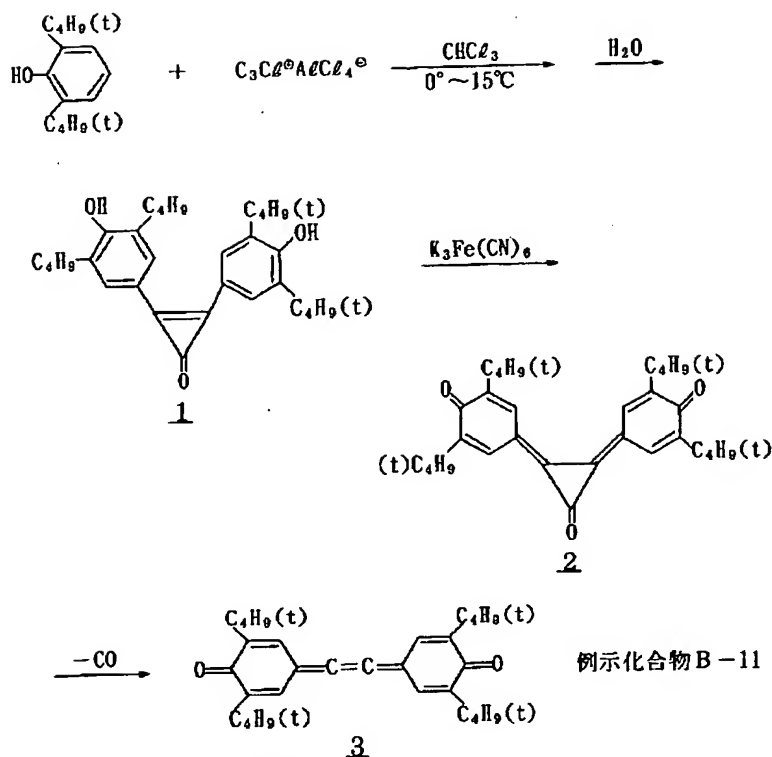
B-30



【0086】：合成例：  
【0087】

【化50】





【0088】上記のスキームに従い、例示化合物B-11を合成した。すなわち、塩化アルミニウム10g (0.075mol) とテトラクロロシクロプロペン13.4g (0.075mol) と塩化メチレン10mlを300mlの四頭フラスコに入れ、窒素気流下、reflux温度、2時間攪拌した。

【0089】その後、その反応液を $-15^\circ\text{C}$ まで冷却し、塩化メチレン10mlを追加して、さらに、75ml塩化メチレンに溶かした2,6-tert-ブチルフェノール30.9g (0.15mol)を加えた。反応温度は $-10^\circ\text{C}\sim 5^\circ\text{C}$ 間を持ち、1時間攪拌した。

【0090】その後、純水100mlを加え、有機層を分離し、塩化メチレン層を $\text{Na}_2\text{SO}_4$ で乾燥し、塩化メチレンを減圧留去し、1の粗結晶を得た。これをエチルエーテル100mlで再結晶し、1を白色結晶にて22.2g (Y64%)得た。

【0091】次に、1 11.6g (0.025mmol) とベンゼン

#### 元素分析データ

測定値

計算値

1リットルと1リットル0.1MKOH溶液に溶かしたフェリシアン化カリウム21.4g (0.065mol)を3リットルの四頭フラスコに入れ、室温で1時間攪拌する。

【0092】その後、有機層を分離し、更によく水洗し、ベンゼン層を $\text{MgSO}_4$ で乾燥し、ベンゼンを減圧留去し、Purple色の2結晶を得た。

【0093】最後に2の粗結晶とベンゼン500mlを三頭フラスコに、 $40^\circ\text{C}$ 温度で、45分攪拌する。さらに数時間を静置した後、ベンゼンを減圧留去し、purple色粗結晶を得た。この粗結晶をアセトニトリルに再結晶し、purple色の結晶として、例示化合物P-11 9.06gを収率84%で得た。

【0094】元素分析値が計算値と一致することから、例示化合物B-11の構造を確認した。

【0095】

	C	H
測定値	83.17 (%)	9.34
計算値	83.33	9.26

【0096】

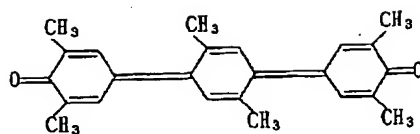
【化51】

(C) 一般式 [C] で表される化合物

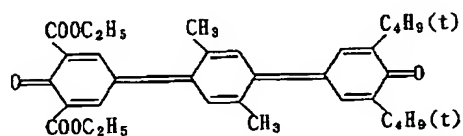
: 例示化合物:

## 例示化合物 C

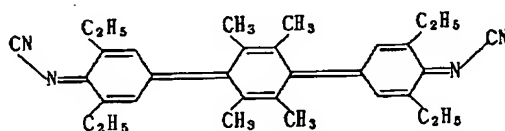
C - 1



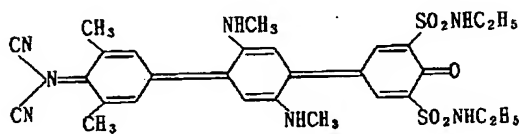
C - 2



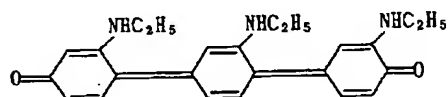
C - 3



C - 4



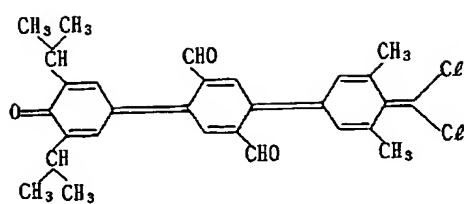
C - 5



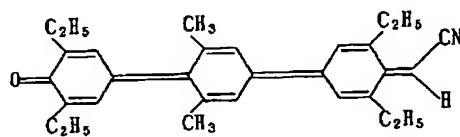
【0097】

【化52】

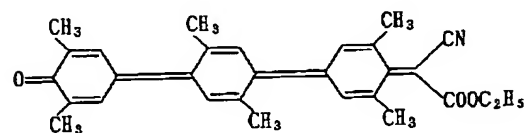
C-6



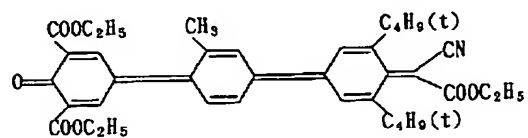
C-7



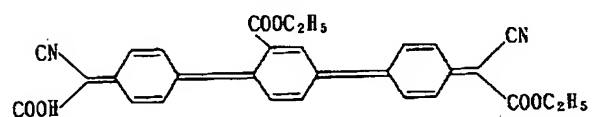
C-8



C-9



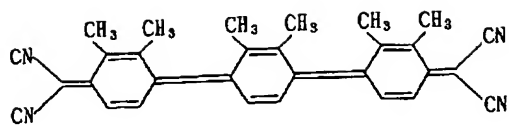
C-10



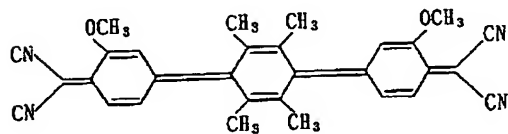
【0098】

【化53】

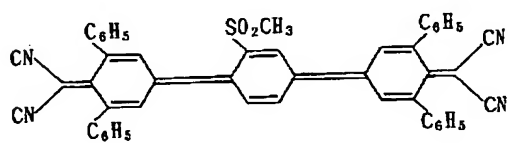
C-11



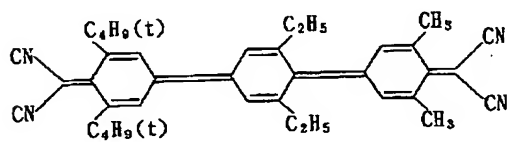
C-12



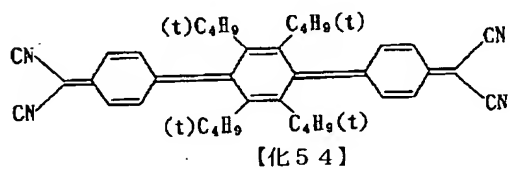
C-13



C-14



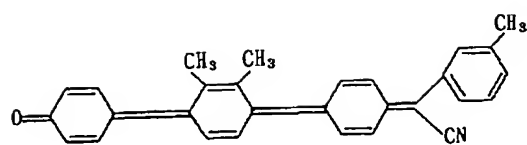
C-15



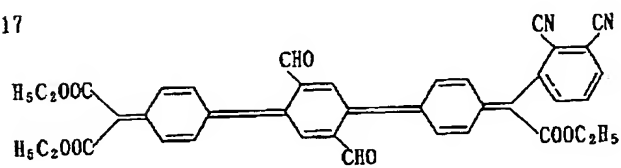
【化 5 4】

【0099】

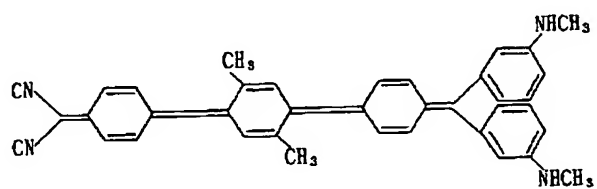
C-16



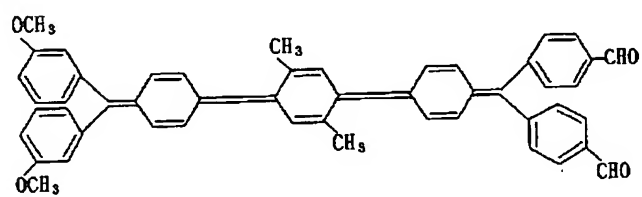
C-17



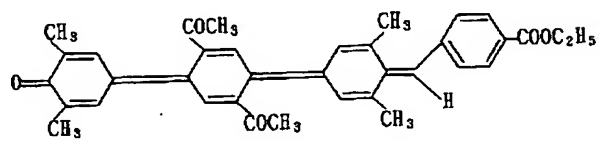
C-18



C-19



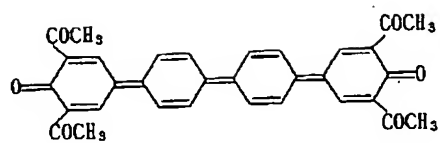
C-20



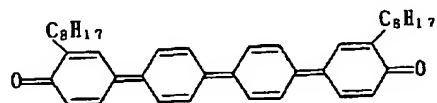
[0100]

[化55]

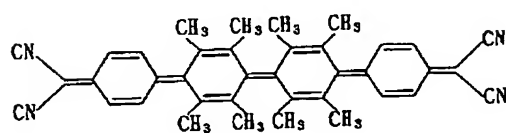
C-21



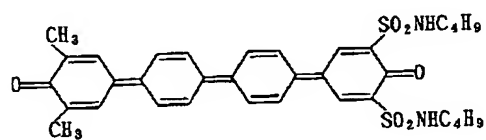
C-22



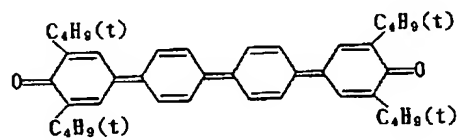
C-23



C-24



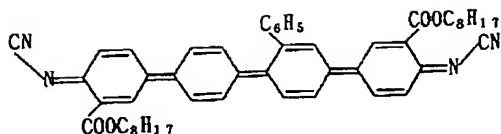
C-25



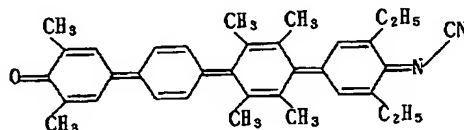
[0101]

[化56]

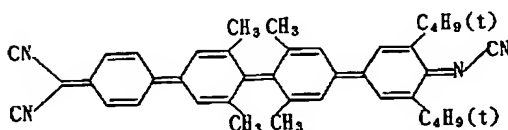
C-26



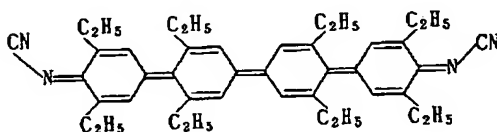
C-27



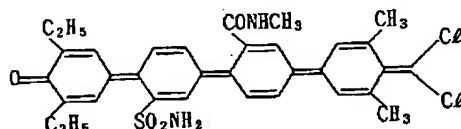
C-28



C-29



C-30



【0102】：合成例：Angewante Chemistry 75, 860

(1963) 文献に従い、例示化合物 C-1 を合成した。

【0103】元素分析値が計算値と一致することから、

#### 元素分析データ

測定値

計算値

例示化合物 C-1 の構造を確認した。

【0104】

	C	H
測定値	83.44 (%)	7.16
計算値	83.68	7.02

本発明の電子写真感光体において、導電性支持体としては、例えば金属パイプ、金属板、金属シート、金属箔、導電処理を施した高分子フィルム、Al 等の金属の蒸着層を設けた高分子フィルム、金属酸化物、第4級アンモニウム塩等により被覆された高分子フィルム又は紙等が用いられる。

【0105】本発明の電子写真感光体において、導電性支持体上には感光層が設けられるが、感光層は単層構造でもよく、電荷発生層と電子輸送層とに機能分離された積層構造のものでもよい。又、導電性支持体と感光層の間に接着層を設けても良い。

【0106】本発明の感光体は、図1(a), (b)に示すように導電性支持体1上に、電荷発生物質(CGM)を主成分とする電荷発生層(CGL)2と電子輸送物質(CTM)を主成分として含有する電子輸送層(CTL)3との積層体より成る感光層4が設けられる。同

図(c), (d)に示すようにこの感光層4は、導電性支持体1上に設けた中間層5を介して設けてもよい。このように感光層4を二層構成としたときに最も優れた電子写真特性を有する感光体が得られる。また本発明においては、図1(e)及び(f)に示すように前記CTMを主成分とする層6中に微粒子状のCGM7を分散してなる感光層4を導電性支持体1上に直接あるいは中間層5を介して設けてもよい。

【0107】更に前記感光層4の上には必要に応じ保護層(OC)を設けてもよい。

【0108】また二層構成の感光層4を構成するCGL2、CTL3は、下層面となる導電性支持体1上に直接あるいは必要に応じて接着層もしくはバリア層などの中間層を設けた上にCTM、CGMの特性によって次の方法によって形成することができる。

【0109】(1) 気相堆積法

## (2) 塗料塗布法

a) CGM、CTMを適当な溶剤に溶解した溶液塗料を塗布する方法。

【0110】b) CGM、CTMをボールミル、ホモミキサ等によって分散媒中で微細粒子状とし、必要に応じて結着剤と混合分散して得られる分散液塗料を塗布する方法。

【0111】前記気相堆積法には真空蒸着法、スパッタリング法、イオンプレーティング法或はCVD法等が挙げられ、また塗料塗布法にはディッピング法、スプレー法、エアドクタ法、ドクタブレイド法、リバースロール法等塗料の物性に合わせて適当な方法が選ばれる。

【0112】接着層は、樹脂単独で形成したもの、酸化錫、酸化インジウム、酸化チタンなどの低抵抗化合物を樹脂中に分散させたものを塗布したもの、又は酸化アルミニウム、酸化亜鉛、酸化珪素などの蒸着膜でもよい。接着層に用いる樹脂としては、特に制限はないが、塩化ビニリデン-塩化ビニル共重合体、水溶性ポリビニルブチラール樹脂、アルコール可溶性ポリアミド樹脂、酢酸ビニル系樹脂、ポリビニルアルコール、ニトロセルロース、ポリイミド樹脂等が挙げられる。

【0113】結着層の膜厚は0.01~10 $\mu$ m程度が好ましく、特に0.01~1 $\mu$ mが好ましい。

【0114】感光層が単層の場合には、例えばポリビニルカルバゾール等の公知の材料から構成された感光層中に上記一般式〔A〕~〔C〕で示される化合物を増感剤として含有させたもの、又は公知の電荷発生物質を含む感光層中に上記一般式〔A〕~〔C〕で示される化合物を電子輸送物質として含有させたものなどが挙げられる。

【0115】一方、感光層が積層型の場合においては、電荷発生層は電子発生物質を導電支持体上に蒸着して得られたものでもよく、電荷発生物質と結着性樹脂とを主成分とする塗布液を塗布することによって形成してもよい。

【0116】電荷発生物質及び結着樹脂としては公知のどのようなものでも使用できる。

【0117】例えば、電荷発生物質としてはTe-Seなどの無機半導体、ポリビニルカルバゾール等の有機半導体、ビスアゾ系化合物、トリスアゾ系化合物、無金属フタロシアニン系化合物、金属フタロシアニン系化合物、ピリリウム系化合物、スクエアリウム系化合物、シアニン系化合物、ベリレン系化合物、多環キノン系化合物等の有機顔料が使用できる。なかでも好ましい電荷発生物質としては、例えば、特開昭64-17066号の27.2°にX線回折ピークを有するY型チタニルフタロシアニン顔料、特開昭62-67094号の26.3°にX線回折ピークを有するA型チタニルフタロシアニン顔料、特開昭61-239248号のX線回折ピークを28.7°に有するB型チタニルフタロシアニン顔料、特公昭49-4338号の無金属フタロシアニン

顔料、特開昭57-163239号の銅フタロシアニン顔料、特開昭57-148747号のバナジルフタロシアニン顔料、特開昭49-128734号のベリレン顔料、特開昭47-18544号の縮合多環顔料、特開昭1-150145号のビスアゾ顔料などがある。又、結着樹脂としては、ポリスチレン、シリコン樹脂、ポリカーボネート樹脂、アクリル樹脂、メタクリル樹脂、ポリエステル、ビニル系重合体、セルロース系樹脂、ブチラール系樹脂、シリコン変性ブチラール樹脂、アルキッド樹脂等が使用できる。

【0118】電子発生層の膜厚は0.01~10 $\mu$ m程度が好ましく、特に0.05~2 $\mu$ mが好ましい。

【0119】電荷発生層の上には電子輸送層が形成される。この電子輸送層は、上記一般式〔A〕~〔C〕で示される化合物と結着樹脂とで構成されるものであって、上記一般式〔A〕~〔C〕で示される化合物、結着樹脂、及び適当な溶剤を主成分とする塗布液を、アプリケーション、バーコート、ディップコート等により、電荷発生層上に塗布することによって形成される。この場合、各種化合物と結着樹脂との混合比は1:100~100:1が好ましく、特に1:20~20:1が好ましい。

【0120】電子輸送層に用いる結着樹脂としては、公知のものならばどのようなものでも使用できる。例えば結着樹脂としては、アクリロニトリル-ブタジエン共重合体、スチレン-ブタジエン共重合体、ビニルトルエンスチレン共重合体、スチレン変性アルキッド樹脂、シリコン変性アルキッド樹脂、大豆油変性アルキッド樹脂、塩化ビニリデン-塩化ビニル樹脂、ポリビニルブチラール、ニトロ化ポリスチレン、ポリメチルスチレン、ポリイソブレン、ポリエステル、フェノール樹脂、ケント樹脂、ポリアミド、ポリカーボネート、ポリチオカーボネート、ポリアクリレート、ポリハロアクリレート、酢酸ビニル系樹脂、ポリスチレン、ポリアリルエーテル、ポリビニルアクリレート、ポリスルホン、ポリメタクリレート等が挙げられる。なかでもビフェニルZ型ポリカーボネートは特に好ましい。又、電子輸送層に電子供与性物質を添加して両極性感光体を作製してもよい。

【0121】更に、電子輸送層に酸化防止剤、ラジカルトラップ剤を添加してもよい。

【0122】電子輸送層の厚さは、2~100 $\mu$ mが好ましく、特に5~50 $\mu$ mが好ましい。

【0123】尚、本発明の電子写真感光体においては、導電性支持体の上に障壁層を設けてもよい。障壁層は、導電性支持体からの不要な電荷の注入を阻止するために有効であり、画質を向上させる作用がある。障壁層を形成する材料としては、酸化アルミニウム等の金属酸化物あるいは、アクリル樹脂、フェノール樹脂、ポリエステル樹脂、ポリウレタン等がある。障壁層は接着層の上に設けてもよく、又、上側に設けてもよい。

【0124】

【実施例】次に本発明を実施例によって具体的に説明す



る。本実施例で「部」とは「重量部」を表す。

#### 【0125】(I) 感度評価

##### 実施例1～30

アルミニウムを蒸着したPETフィルム上にポリアミド樹脂「CM8000」（東レ社製）からなる厚さ $0.5\mu\text{m}$ の中間層を設け、その上に「化57」に示すバリレン顔料G-1 1部、ポリビニルブチラール樹脂「エスレックBMS」（積水化学工業社製）0.2部、分散媒としてメチルエチルケトン50部をサンドミルを用いて分散した液をワイヤバーを用いて塗布して膜厚 $0.3\mu\text{m}$ の電荷発生層を形成した。次いで表1～3に示す例示化合物1部とポリカーボネート樹脂「ユーピロンZ-200」（三菱瓦斯化学社製）1.5部をテトラヒドロフラン（THF）10部に溶解し、電荷発生層上にブレード塗布して膜厚 $20\mu\text{m}$ の電子輸送層を形成した。

#### 【0126】比較例1

例示化合物の代わりに「化57」に示す比較化合物1を用いた以外は実施例1と同様にして比較サンプルを作成した。

#### 【0127】評価1

実施例1～30及び比較例1により得られた電子写真感光体サンプルについて静電複写紙試験装置EPA-8100（川口電気社製）を用いて、+800Vに帯電させ、10 lxの白色光を露光し、表面電位が半分になるまでの露光量を求め、感度とした。結果を表1～3に示す。

#### 【0128】(II) 耐用性評価

##### 実施例31～60

アルミニウムを蒸着したPETフィルム上にポリアミド樹脂「X-1874M」（ダイセルヒュルス社製）からなる厚さ $0.5\mu\text{m}$ の中間層を設け、その上に顔料X型無金属フタロシアニン（大日本インキ社製）1部、ポリビニルブチラール樹脂「エスレックBX-1」（積水化学工業社製）0.4部、分散媒としてメチルイソプロピルケトン50部をサンドミルを用いて分散した液をワイヤバーを用いて塗布して膜厚 $0.3\mu\text{m}$ の電荷発生層を形成した。次いで表4～6の例示化合物1部とポリカーボネート樹脂「ユーピロンZ-200」（三菱瓦斯化学社製）1.5部をTHF10部に溶解し、電荷発生層上にブレード塗布して膜厚 $20\mu\text{m}$ の電子輸送層を形成した。

#### 【0129】比較例2

例示化合物の代わりに「化57」に示す比較化合物2を用いた以外は実施例31と同様にして比較サンプルを作成し

た。

#### 【0130】評価2

実施例31～60及び比較例2により得られた電子写真感光体サンプルを（コニカ社製）「U-Bix1017」改造機により初期及び10000枚コピー後の以下の実測値で評価した。結果を表4～6に示す。

【0131】Vb：黒色部電位、Vw：白色部電位、Vr：残留電位

#### (III) 画質評価

##### 実施例61～90

円筒形アルミ基体上にポリアミド樹脂「CM8000」（東レ社製）からなる厚さ $0.5\mu\text{m}$ の中間層を設け、その上にX線回折におけるブラッグ角 $2\theta$ の $9.5^\circ$ 、 $24.1^\circ$ 、 $27.2^\circ$ にピークを有するチタニウムフタロシアニン1部、シリコーンブチラール樹脂0.5部分散媒としてメチルイソプロピルケトン50部をサンドミルを用いて分散した液をディップ塗布して膜厚 $0.3\mu\text{m}$ の電荷発生層を形成した。次いで表7～9に示す例示化合物1部とポリカーボネート樹脂「ユーピロンZ-200」（三菱瓦斯化学社製）1.5部をTHF10部に溶解し、電荷発生層上にディップ塗布して膜厚 $20\mu\text{m}$ の電子輸送層を形成した。

#### 【0132】比較例3

例示化合物の代わりに「化57」に示す比較化合物3を用いた以外は実施例61と同様にして比較サンプルを作成した。

#### 【0133】評価3

実施例61～90及び比較例3により得られた電子写真感光体サンプルについて、（コニカ社製）デジタルコピー「Konica9028」改造機（帯電極性：正、反転現像）にて画像出しを行った。次にこれらのサンプルを低温（ $10^\circ\text{C}$ ）環境下に1ヶ月放置し、その後再び同一条件で画像出しを行った。これらの複写画像の白地部分の黒斑点を評価した。結果を表7～9に示す。

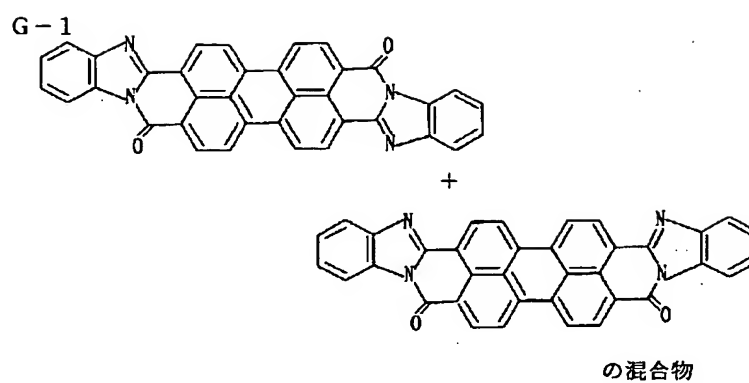
【0134】なお、黒斑点の評価は、画像解析装置「オムニコン 300型」（島津製作所製）を用いて黒斑点の大きさと個数を測定し、直径 $0.05\text{mm}$ 以上の黒斑点が $1\text{cm}^2$ あたり何個あるかを判定することにより行った。黒斑点評価の判定基準は以下に示す通りである。なお、黒斑点判定の結果が◎、○であれば実用になるが、△に実用に適さないことがあり、×である場合は実用に適さない。

#### 【0135】

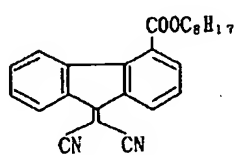
直径 $0.05\text{mm}$ 以上の黒斑点の個数（個/ $\text{cm}^2$ ）	黒斑点判定
0	◎
1～3	○
4～10	△
11以上	×

#### 【0136】

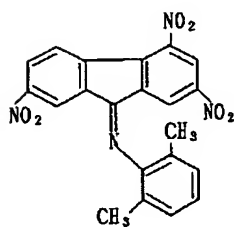
#### 【化57】



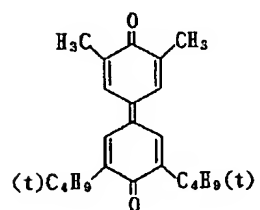
比較化合物 1



比較化合物 2



比較化合物 3



【0 1 3 7】

【表 1】

A 1	
実施例 No.	例示化合物 No.
1	A-1
2	A-3
3	A-4
4	A-7
5	A-15
6	A-19
7	A-20
8	A-27
9	A-28
10	A-30

B 1	
実施例 No.	例示化合物 No.
11	B-1
12	B-2
13	B-3
14	B-4
15	B-5
16	B-6
17	B-7
18	B-8
19	B-9
20	B-11

A 2	
サンプル	感度( $\text{lux} \cdot \text{sec}$ ) +800 V
実施例 1	2.0
2	2.4
3	3.1
4	2.5
5	3.2
6	2.7
7	2.5
8	2.2
9	2.8
10	2.5
比較例 1	7.3

【0138】  
【表2】

B 2	
サンプル	感度( $\text{lux} \cdot \text{sec}$ ) +800 V
実施例 11	3.2
12	3.3
13	3.5
14	3.6
15	4.0
16	4.2
17	4.8
18	3.2
19	3.0
20	2.4
比較例 1	7.3

【0139】  
【表3】

C 1

実施例 No.	例示化合物 No.
21	C-1
22	C-2
23	C-3
24	C-4
25	C-5
26	C-6
27	C-7
28	C-8
29	C-9
30	C-10

【0140】

【表4】

C 2

サンプル	感度 (lux·sec) +800 V
実施例21	4.3
22	4.5
23	5.0
24	5.1
25	4.8
26	4.3
27	4.7
28	5.5
29	4.5
30	4.7
比較例 1	7.3

## A 1

実施例 No.	例示化合物 No.
31	A-31
32	A-34
33	A-40
34	A-45
35	A-46
36	A-51
37	A-57
38	A-58
39	A-59
40	A-60

## A 2

サンプル	初 期			10,000コピー後		
	V <sub>b</sub>	V <sub>w</sub>	V <sub>r</sub>	V <sub>b</sub>	V <sub>w</sub>	V <sub>r</sub>
実施例31	880	140	20	865	145	25
32	855	160	25	850	160	35
33	890	155	35	870	160	40
34	860	160	25	850	170	40
35	870	145	30	835	160	50
36	860	140	40	860	155	60
37	880	150	30	820	165	50
38	840	135	20	815	150	45
39	835	125	25	815	145	40
40	860	150	20	845	155	45
比較例 2	730	125	40	725	250	100

【0141】

【表5】

## B 1

実施例 No.	例示化合物 No.
41	B-10
42	B-12
43	B-13
44	B-14
45	B-15
46	B-16
47	B-17
48	B-18
49	B-19
50	B-20

## B 2

サンプル	初 期			10,000コピー後		
	V <sub>b</sub>	V <sub>w</sub>	V <sub>r</sub>	V <sub>b</sub>	V <sub>w</sub>	V <sub>r</sub>
実施例41	720	110	20	705	125	50
42	725	120	30	710	130	40
43	730	130	35	720	135	45
44	742	110	25	725	115	45
45	720	130	35	740	145	39
46	730	125	40	720	130	50
47	735	115	35	730	130	45
48	725	120	30	725	140	45
49	740	125	25	720	130	35
50	735	135	35	715	145	30
比較例 2	730	125	40	725	250	100

【0142】

【表6】

## C 1

実施例 No.	例示化合物 No.
51	C-11
52	C-12
53	C-13
54	C-14
55	C-15
56	C-16
57	C-17
58	C-18
59	C-19
60	C-20

## C 2

サンプル	初 期			10,000コピー後		
	V <sub>b</sub>	V <sub>w</sub>	V <sub>r</sub>	V <sub>b</sub>	V <sub>w</sub>	V <sub>r</sub>
実施例51	710	120	20	705	115	35
52	725	130	25	700	120	50
53	740	135	25	725	115	45
54	730	125	30	715	110	45
55	725	115	40	720	105	60
56	735	118	25	710	110	40
57	715	125	35	698	100	55
58	710	120	25	700	115	45
59	735	135	30	715	115	50
60	725	125	20	705	110	40
比較例 2	730	125	40	725	250	100

【0143】

【表7】

## A 1

実施例 No.	例示化合物 No.
61	A-62
62	A-64
63	A-65
64	A-70
65	A-71
66	A-74
67	A-82
68	A-83
69	A-89
70	A-90

## B 1

実施例 No.	例示化合物 No.
71	B-21
72	B-22
73	B-23
74	B-24
75	B-25
76	B-26
77	B-27
78	B-28
79	B-29
80	B-30

## A 2

サンプル	初 期	10℃放置後
61	◎	◎
62	◎	○
63	◎	○
64	◎	○
65	◎	○
66	◎	○
67	◎	○
68	◎	△
69	◎	○
70	◎	○
比較例 3	△	×

【0144】  
【表 8】

## B 2

サンプル	初 期	10℃放置後
71	◎	◎
72	◎	◎
73	◎	◎
74	◎	○
75	◎	○
76	◎	○
77	◎	△
78	◎	○
79	◎	○
80	◎	◎
比較例 3	△	×

【0145】  
【表 9】



## C 1

実施例 No.	例示化合物 No.
81	C-1
82	C-5
83	C-10
84	C-16
85	C-21
86	C-24
87	C-21
88	C-26
89	C-27
90	C-30

## C 2

サンプル	初 期	10℃放置後
81	◎	◎
82	◎	◎
83	◎	○
84	◎	○
85	◎	○
86	◎	◎
87	◎	◎
88	◎	◎
89	◎	○
90	◎	○
比較例 3	△	×

【0146】以上、各表から明らかなように、本発明の電子輸送物質を用いた電子写真感光体は、従来の電荷輸送物質を用いた電荷写真感光体と比較して、感度が高く、繰返し使用時の感光体特性も安定しており、また、低温保存後も画像欠陥の発生が極めて少ないことがわかる。

## 【0147】

【発明の効果】本発明の化合物は電子輸送能を有し、高感度、低残留電位、良好な画質保持性をもつ正帯電用積層型感光体を提供することができる。

## 【図面の簡単な説明】

【図1】本発明の感光体の実施態様の断面図

## 【符号の説明】

- 1 導電性支持体
- 2 電荷発生層 (CGL)
- 3 電子輸送層 (CTL)
- 4 感光層
- 5 中間層
- 6 電子輸送物質を含有する層
- 7 電荷発生物質

【図 1】

